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This report is one of ten regional case studies that was funded by the Office of Technology Assessment (OTA) of the U.S. Congress for use in its study, "Wetlands: Their Use and Regulation." The views expressed do not necessarily represent those of OTA. Because of regional variations in wetlands use throughout the United States, the findings made in this report may not reflect national trends that are described in the OTA report. This report has neither been reviewed nor approved by OTA's Technology Assessment Board.

WETLAND TRENDS AND PROTECTION PROGRAMS IN NEBRASKA

September, 1982

Submitted by
the

GREAT PLAINS OFFICE OF POLICY STUDIES
Center for Great Plains Studies
University of Nebraska, Lincoln

to

OFFICE OF TECHNOLOGY ASSESSMENT
U.S. Congress
Washington, D.C.

J952-85

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WETLANDS IN THE PRAIRIE POTHOLE REGION OF MINNESOTA, NORTH DAKOTA, AND SOUTH DAKOTA--TRENDS AND ISSUES

by

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August 1982
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PREFACE

This study represents a transdisciplinary effort by several faculty members and researchers at the University of Nebraska. Dr. Charles Deknatel, an environmental scientist and planner with the Community and Regional Planning Department of the College of Architecture, compiled the review of wetland trends in Nebraska and identified important substantive factors behind these trends.

Economic factors and considerations influencing these trends were evaluated by Dr. F. Gregory Hayden, a public resource economist with the University's Department of Economics. Part of his analysis attempts to assess the profitability of farmers and other landowners converting wetland areas to expanded agricultural use. Possible influences of related public programs also are addressed.

J. David Aiken, a water law specialist with the Department of Agricultural Economics, provided an analysis of existing legal protection of wetlands in Nebraska. He also provided legal analysis of several related issues and consultation on other aspects of the study.

Douglas Kruse, a researcher and graduate student in economics at the University, prepared an evaluation of the Nebraska property tax system and its influence on wetland trends. He also assisted other study members throughout the project.

Ellie Seright, secretary at the Center for Great Plains Studies, assisted in editing and producing the final report.

Appreciation is extended to the University's Water Resources Center for the assistance it gave in receiving the contract to do this study. Finally, a sincere thanks is extended to the many persons both in and out of state and federal government contacted in the course of the study for their cooperation and assistance.

Dr. Larry D. Swanson
study coordinator & Administrator
Great Plains Office of Policy Studies

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DISCUSSION

This report describes wetland resources in Nebraska and trends regarding their distribution and use, identifies and evaluates important factors behind these trends, and assesses the protection provided wetlands under existing public programs intended to maintain them. An underlying valuation predetermining such a study is that wetlands are in fact important resources and beneficial to society. Thus, it should be noted that observations, analyses and discussions contained in this report reflect this valuation.

Nebraska Wetland Resources

Wetlands in Nebraska are varied and diverse. Three major wetland regions of the state are generally focused upon in the study: the Rainwater Basin of south-central Nebraska and its shallow and moderately-deep marshes and seasonally-flooded basins; the central Platte Valley and its wet meadows, seasonally-flooded flats and riparian wetland areas; and, the Sandhills region and its extensive wet meadow areas, shallow and deep marshes and natural lakes.

While these wetlands function in flood retardation, in retention of sediment and nutrients, as groundwater recharge points and as aesthetic and recreational resources; their importance to migratory birds and as year-round wildlife habitat is emphasized in Nebraska. The Platte River Valley is of continental significance as a unique staging area for sandhill crane. As has been noted:

> Cranes winter over thousands of square miles in two countries. Their nesting grounds span three countries on two continents. But, for several vital weeks every spring, the vast majority of the world's sandhill crane population relies on a shrinking stretch of habitat on Nebraska's Platte River. (NGPC, 1982, "Sandhill Crane . . ," p. 7)

The area is also recognized as critical habitat for the endangered whooping cranes. Along with the Rainwater Basin, the Platte Valley is heavily used by migratory waterfowl including 95 percent of the overall population of white-fronted geese. Historically, these wetlands have had national notoriety as a recreational resource.

> At the turn of the century, wealthy hunters from the east were coming to south-central Nebraska to shoot waterfowl, often pulling their private rail cars onto

> [sidings in small communities] and staying for two or three weeks. (NGPC, 1982, "The Rainwater Basin . . ," p. 2)

The Nebraska Sandhills are the largest undivided expanse of native grasslands remaining in the United States. Its wetlands are significant habitat areas for waterfowl and shore birds as well as upland game and furbearers. The highly productive wet meadows are of central importance as a source of hay production to the area's ranching system.

Extent of Wetlands

Estimates vary on both the historical and existing geographic extent of wetlands in these regions. However, it is generally estimated that between 14,000 to 24,000 acres of wetlands remain in the Rainwater Basin. At the lower end of this estimate, wetland acreage reflected is largely viable wildlife habitat. Additional acreage beyond this in the estimate range reflects progressively less viable wetland habitat. At the upper end, wetlands are increasingly nonfunctioning entities even though they still may act as periodic collection points for water.

What remains in the Rainwater Basin represents roughly 15 to 25 percent of the area's original wetland acreage (pre-settlement).

The Sandhills contain over 1 million acres of wetlands with much of this in the form of wet meadows and shallow marshes. The region's wetland system has remained largely intact under the area's ranching economy and 85 to 95 percent of its original wetland acreage remains functioning and viable today.

Estimates of existing or past wetland acreage in the central Platte Valley have not been made. However, it is generally estimated that roughly 30 to 45 percent of its original wet meadows and seasonally-flooded flats remain while an even smaller percentage of its original riparian wetlands remain viable habitat areas.

Wetland Trends

All three of these major wetland areas are outside metropolitan areas and are, for the most part, subject to influences tied to agriculture and rural road upgrading and improvement. Major technological and development trends affecting these wetlands are associated with irrigation development and the closely associated extension of row-crop agricultural production.

Nebraska is one of the most extensively irrigated states in the nation. Much of this development occurred in two phases. The first involved a tremendous increase in gravity-flow irrigation in the 1950s primarily in south-central and central Nebraska. The second is tied to the relatively recent surge in irrigation using center-pivot technology. With it, irrigation has intensified in previously irrigated areas and extended throughout other parts of the state, most noteably, parts of the Sandhills.

In the Rainwater Basin, drainage provided through the rural road system in conjunction with agricultural-related drainage practices such as installation of ditches, reuse pits or dugouts, and land leveling are principally responsible for the loss and deterioration of wetlands.

In the central Platte Valley, similar drainage practices are used but much of the deterioration of wet meadows and shallow flats has resulted from simply land use changes requiring little or no direct drainage or land alteration. Wetlands in the Platte Valley are groundwater-level sensitive. Some groundwater decline in the area associated with groundwater irrigation development in the Platte Valley and upstream streamflow losses of the Platte River have made these wetlands more accessible for intensive agricultural use.

As much as 70 percent of the Platte River's flows are lost before reaching the central Platte Valley due to existing impoundments and diversions in Nebraska, Colorado and Wyoming. A number of proposals have been recently made for additional Platte River diversions. Many backwater areas and other riparian wetlands have been greatly altered by encroachment of woody vegetation largely tied to stabilization and loss of Platte River flows.

Loss and deterioration of wetlands have reached the critical stage in both the Rainwater Basin and Platte Valley and the loss trend is continuing.

Sandhills wetlands are also highly sensitive to groundwater levels in the region. Although relatively stable historically, expanding center pivot irrigation in several areas of the Sandhills now poses a serious threat to the area's wetlands. Direct impacts result from land leveling and drainage practices sometimes used in installing these systems. Indirect impacts result from seasonal and potentially long-term declines in the area's groundwater levels.

Impacts Associated with Wetland Loss

The major impact of wetland loss in Nebraska is the concentration of wildlife in fewer and smaller areas and the reduction of important components of their food supply and breeding, roosting and staging areas. Repercussions of this loss of habitat are increasingly visible. The Nebraska Game and Parks Commission discontinued annual aerial surveys of duck populations in the Rainwater Basin in 1975 because of a decline in those breeding in the area (NGPC, 1982, p. 9).

With the general concentration of birds in remaining wetlands, the risk of disease has increased. In 1975, Nebraska experienced its first major outbreak of fowl cholera. Since then . .

> . . fowl cholera die-offs have become as much a part of spring in the Rainbasin as are farmers working their fields for planting . . [In 1980] over 30,000 dead ducks and geese were picked up [by biologists]. The estimated loss in the Rainbasin was 72,000 to 80,000 birds, the second largest fowl cholera die-off ever reported in the U.S. (NGPC, 1982, p. 12)

Aircraft and "zon guns" (propane-explosion devices) have been used in recent years to frighten birds from cholera-infected basins. "Three years ago when cholera was at epidemic proportions . . both federal and state game personnel were forced to keep all-night vigils to prevent whooping cranes from settling in a highly contagious area" (Magazine of the Midlands, Omaha World-Herald, "The Wetlands are Going Dry," June 6, 1982).

Besides the loss of habitat and its effects, potential long-term and widespread deterioration of wet meadow hay fields in the Sandhills would have a devastating effect on Sandhills ranchers and the livestock feeders they supply.

A positive impact of this loss has been the general increase in potentially more productive land for agricultural use.

Economics of Wetland Conversion

In converting wetlands in Nebraska through drainage or some other means to more intensive agricultural uses, farmers and landowners in the state have been influenced in a number a ways. Until relatively recently, federal agencies such as the Agricultural Stabilization and Conservation Service and Soil Conservation Service provided farmers technical and cost-share assistance to help them drain wetlands as a matter of explicit public policy. With gradual changes in these policies and their implementation, drainage of wetlands with federal cost-share assistance is increasingly less frequent.

Attitudes and values generally held by farmers also play a role. As several studies have verified, land is looked upon by farmers as something to utilize and wetlands are often viewed as aggravations. Wetlands are fine just as long as they're on someone else's land. The term "wetland" is a foreign one to farmers. Such areas are "lowlands." In general, evidence suggests that farmers are inclined to drain these areas regardless of the profitability of doing so.

Several case analyses were constructed to attempt to gauge the actual profitability of investing in the conversion of wetlands for expanded agricultural use. Fifteen cases in all were evaluated some of which reflect the economic proposition for farmers and other landowners presented by the most common types of wetland conversions occurring in the regions. The results of these analyses are summarized on page 71.

In the Rainwater Basin, wetland conversion to irrigated corn production facilitated by installation of a reuse pit system or dugout has offered farmers only a modest economic return. Without federal cost-share assistance, converting around 10 acres (as part of a larger field) of wetlands in this way generated an estimated average annual net revenue of around $10 per acre converted over a 16-year period from 1965 to 1980. Annual net revenue estimates varied considerably over the period (in actual dollars) ranging from a loss of over $65 per acre converted in 1980 to a gain of over $87 in 1974.

If cost-share assistance is received for the same type of conversion in paying for the reuse pit system, the estimated annual cash receipts average around $30 per acre over the 16-year period. Again, the range is considerable ranging from a loss of around $21 in 1980 to a gain of over $100 per acre converted in 1974.

Conversion of wetlands to dryland wheat production in the Rainwater Basin would appear to be generally unprofitable (when it is assumed that the conversion is made with the installation of a large dugout system). Under this type of conversion, an average per acre loss of nearly $8 is incurred over the period.

In the central Platte Valley, conversion of subirrigated wet meadows used as pastures to irrigated corn or alfalfa production would not appear to be profitable. In the analysis, this largely results from the assumed substitution of the production from one form of irrigation which is increasingly expensive (groundwater pumping using electricity, propane or gas) for the different production (grass) of another form of irrigation which is essentially costless (natural subirrigation).

In the Sandhills, converting land containing wetlands to irrigated corn using center pivots may be profitable for ranchers if land-shaping costs are low and yields high (up to over $50 per acre converted on average for the period). Where Sandhills land is suitable for irrigated row-crop production, this combination of factors may occur. On more marginal lands, profitability is doubtful.

Where additional land and management costs are included as with outside investors or developers (as was assumed in the analysis), the profitability of Sandhills rangeland conversion to irrigated corn production is increasingly doubtful regardless of land factors involved (income tax provision effects are ignored in the analysis).

Analysis in all three regions suggests that wetland conversions will likely become even less profitable in the years ahead. Agricultural costs are rising far in excess of receipts and public assistance to defray costs of wetland conversion appears less and less likely.

An estimate of the impact wetland conversions have been having on the Rainwater Basin area's economic base suggests that this phenomenon is of little importance to the region's overall economic wellbeing.

Influence of Property Taxation on Wetland Conversion

In Nebraska and other states, it is sometimes asserted that the system of property taxation serves to induce landowners to make essentially nonproductive more productive, i.e., drain wetlands so that they can be farmed. This stems from the fact that all land is taxed regardless of its use. In Nebraska, although all land is taxed, it is taxed according to the expected income from its "best use" which is assumed to be its current or existing use. Viable, uncultivated marsh areas may be classified as "wastelands" under the state's property tax system, and, thereby be assigned only a nominal value of $10 to $25 per acre.

Seasonally-flooded flats and subirrigated meadows left to grass and pastured or hayed when possible may be classified as rangeland with average to moderately low yields. Under this classification, assessed land values range anywhere from $70 to $240 per acre.

Although landowners still pay property taxes on wetlands even if they generate little or no income, these taxes are nominal. Taxes on marshland with no production in the Sandhills amount to around 10 cents per acre. Sandhills wet meadows used for hay production are taxed at around a dollar per acre a year. If placed under irrigated corn production and reassessed accordingly, these taxes increase anywhere from four to nine times. A similar situation occurs for Platte Valley wet meadows converted likewise.

In the Rainwater Basin, taxes on nonproductive marshes where the farmer does not attempt to farm them may be as low as 20 cents per acre a year. If drained and converted to irrigated corn production, taxes increase substantially to as much as $10 per acre.

Thus, if existing methods of property taxation are well understood by landowners in the state and are properly applied by local county assessors, they should not be an inducement for wetland conversion and loss.

Legal Protections of Wetlands

As previously noted in an earlier study, ". . Nebraska law does not address the issue of identifying and preserving wetlands" ("Drainage of Diffused Surface Waters," Task Force Report #2 to the Nebraska Natural Resources Commission, November 1981). This finding is confirmed in this study.

Nebraska statutes and court decisions have given landowners considerable discretion in draining wetlands. The major issue in Nebraska drainage law has not been whether landowners can drain wetlands, but whether they are liable for increasing the flow of surface water onto lower landowners.

The most significant modern drainage authorities have been given to local natural resources districits (NRDs) in the state. NRDs are given broad drainage authority and taxing authority to carry-out such projects. While more recently enacted environmental quality statutes authorize the State Department of Environmental Control (DEC) to regulate drainage activities, these haven't been used.

It is unclear whether a landowner is entitled to compensation for wetland loss or subirrigated meadow drainage resulting from groundwater drawdown by local irrigators.

With the Nebraska Supreme Court reversal of a 44-year prohibition on interbasin surface water transfers in the state, there has been a race among irrigation development interests to acquire Platte River water rights for in-basin and out-of-basin uses. Seven major irrigation projects have been proposed. Interbasin water transfer appropriations must be approved by the State Department of Water Resources (DWR). All appropriations must be reviewed pursuant to the Nebraska Endangered Species Act to determine if they may interfere with the continued existence of endangered or threatened species.

If any of these projects are developed, a significant impact on riparian wetlands may occur. Such an impact will need to be considered in making water-rights decisions. Even if water rights are issued for any Platte River irrigation projects, financing must be obtained which may be the biggest hurdle to these projects.

A constitutional amendment proposing the state legislature authorize state revenue bonds for surface water projects comes before Nebraska voters in November (1982). However, even if passed, it may not provide a significant means for state financing of water development because it is tied to the repayment capacity of water users. Traditionally, water users' charges have provided sufficient revenue for operation and maintenance costs of water projects only with little available for construction cost repayment. This cost has conventionally been assumed by the federal government but this support has been reduced in recent years.

In summary, although several programs exist in the state for protecting wetlands through public acquisition, easement purchase or contracting with private landowners; Section 404 of the Clean Water Act and its permit requirement is the only regulatory measure currently available in the state for potentially protecting the state's remaining wetlands.

the LMA map). LVG W and 3R1 categories for each LMA are as follows:

LMA	LVG 3R1	LVG W
1	$70-85/acre	$10/acre
2	80-135	10
3	130-185	20
4	85-140	15
5	110-200	15
6	195-240	20
7	none	25

While LVG W, by definition, does not have an expected income, it has nonetheless been assigned a "nominal value" of $10-25 per acre.

These land values are mandatory for each LVG group since 1979. From 1974 to 1979 the State issued guidelines for each county to follow in assigning values to LVG groups, but these guidelines were not mandatory. Before 1974 there were no guidelines, and each county did its own estimation of land values for taxation purposes or hired firms to estimate land values. This method resulted in disparities among counties in assessed values for the same land types, resulting in pressure for state guidelines and eventually mandatory values for each LVG group.

Application of Valuation Procedures at the County Level

The county assessors of five Nebraska counties were contacted in order to determine how the valuation procedure for agricultural land is carried out at the county level.

The basis of the valuation procedure is the Soil Survey for each county prepared by the Soil Conservation Service. Two of the counties contacted were working off of Soil Surveys done in the last two years, while the other three counties had Soil Surveys in progress but are presently working off of Soil Surveys prepared in the late 1960s. The Soil Survey produces for each section of land an 8" by 8" map which contains lines dividing areas with different soil types with each soil type labeled. The soil classification is broad enough to include the moisture content of the soil and what kinds of foliage are supported by the soil.

Each county prepares a conversion table for converting the SCS symbols for soil types into the less-numerous LVG classifications. A clear overlay is set upon the Soil Survey map, the lines are traced over, and the land areas are reclassified. Where the soil type does not translate directly or unambiguously into an LVG group, the assessor's office relies upon aerial photos of the land taken by the Federal Agricultural Stabilization and Conservation Service every two years.

To determine the number of acres in each land area, the county assessors use either a "dot counter" or "planimeter." The dot counter is a clear plastic sheet with a grid of 10 dots per acre on the 8" by 8" map. The dot counter is placed over a particular land area on the clear overlay traced from the Soil Survey map, and the number of dots in that area is manually counted. The total is then divided by ten to determine the acreage in that area--for instance, 216 dots represents 21.6 acres. While four of the contacted counties use this method, one uses the planimeter. This is a small machine with an elbowed arm, one end of which clamps to the surface underneath the map, and the other end of which is used to "trace" the perimeter of a particular land area and internally calculate the area inside that perimeter. The tracing is done manually.

Once the acreages of the LVG groups within a section have been computed, the totaled acreage may be "justified" to ensure that it comes out to 640 acres. Some adjustment may also take place when the acreage computed in this way for each farmer does not correspond to the farmer's actual acreage.

In this way the acreage in each LVG group for each section of land in the county is computed and recorded on tables to be assigned a value as described in previous sections. No one from the assessor's office goes out and actually looks at the land unless a change has been reported, usually by the farmer. Field research may also be undertaken if there is some other indication that land use may have changed, such as an increase in the number of wells on the "Well List" for each county, perhaps signaling an increase in irrigated land. None of the assessors' offices reported that they do any routine or other checking on land use without some indication that land use has changed.

Each of the assessors was asked whether there had been any special concerns raised about wetland valuations by farmers, and each response was negative. One potentially important fact was noted by one assessor on a personal visit, and this is that there is a fair amount of individual discretion in translating land uses from the Soil Surveys and aerial photos into LVG groups. She displayed an example of a classified section and noted two areas obviously covered by water. One was smaller than the other and covered about an acre and was classified as "pasture" along with the surrounding land which was not wet. Her justification for this was that the wet land, while it does not produce direct benefits for a farmer, still benefits the surrounding pasture by helping to drain it. The larger wetland in the photo was also classified in the same way as the land around it, although she said in that instance that her personal judgment would have been to classify it separately, as wasteland or 3R1, because of its size.

This illustrates two points: 1) there is some individual discretion in classifying land uses over which there may be reasonable debate; and 2) small wetlands may not be classified separately from the land around them. The dynamic characteristics of wetland areas and the variability in the degree to which they can be used agriculturally may present many problems in properly assessing their value for taxation purposes.

Using the property taxation guidelines just enumerated, the following assessed values for various types of land and associated uses were estimated along with the annual tax payments at an assumed rate of one percent. The first example is for a typical wet-meadow area in the Sandhills. The initial estimates shown reflect its assessed value if used for hay production. The second set are estimates if converted to irrigated corn production. The final estimates indicate what marshland classified as "wasteland" would be assessed.

The second set of estimates are for the Central Platte Valley. Values for a wet-meadow area left in native grasses and used for hay production are first shown. Values if converted to irrigated corn production under assumption of both "high yields" and "low yields" are next shown.

Finally, the third set show values for Rainwater Basin wetland areas classified as marsh (wastelands) and lands used for irrigated

ESTIMATED ASSESSED VALUES AND TAX PAYMENTS FOR DIFFERENT WETLANDS AND USES

	Assessed Value	Taxes at 1% Rate
Sandhills Wet Meadow (LMA 2)		
hay production (3R1)	$100-135/acre	$1.10-$1.35
irrigated corn production		
high yield (1A)	$845-930/acre	$8.45-$9.30
below ave. (3A)	$430-470/acre	$4.30-$4.70
marsh (wasteland)	$10/acre	$ .10
Central Platte Valley Wet Meadow (LMA 5)		
hay production (3R1)	$160-195/acre	$1.60-$1.95
irrigated corn production		
high yield (1A)	$1070/acre	$10.70
below ave. (3A)	$580/acre	$5.80
Rainwater Basin Wetland (LMA 6)		
marsh (W)	$20/acre	$ .20
irrigated corn production		
high yield (1A)	$1070/acre	$10.70
below ave. (3A)	$580/acre	$5.80

corn production (for both high yield and low yield categories).

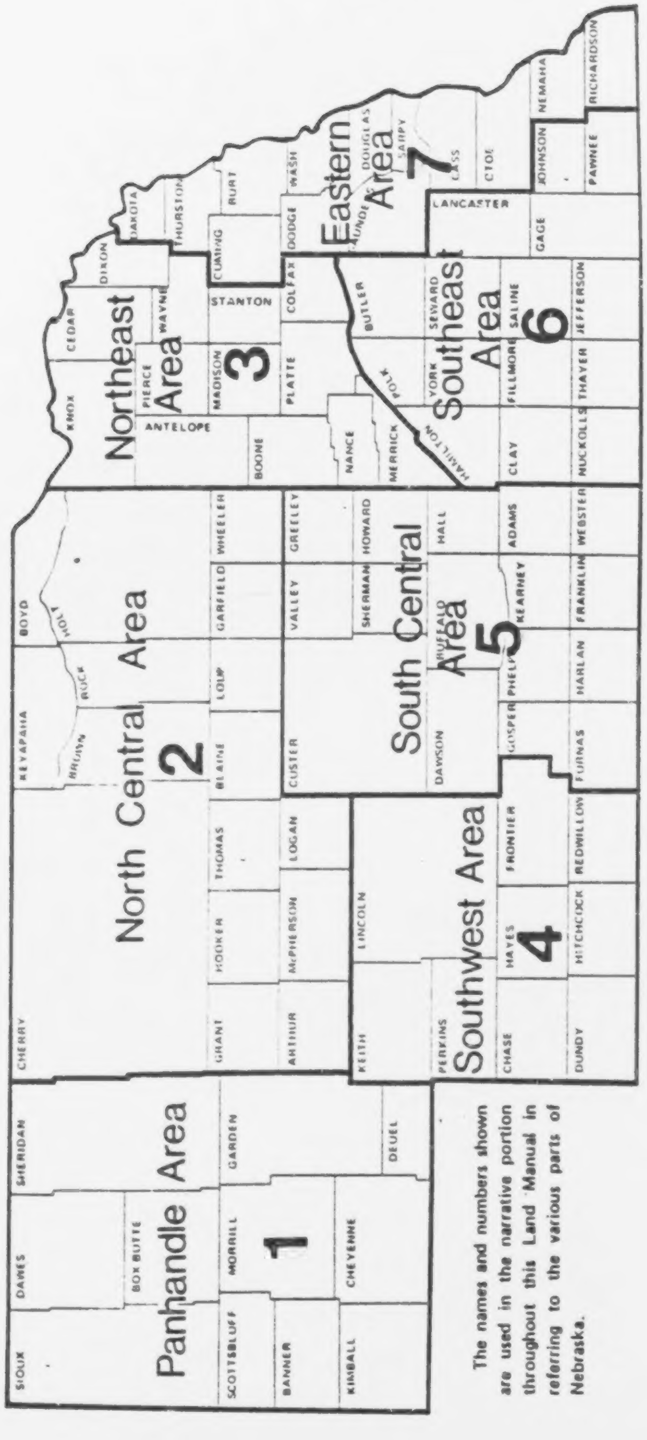
Although landowners still pay property taxes on wetland areas even if they receive no production from them, these taxes are nominal. Taxes on marshland with no production in the Sandhills amount to around 10 cents per acre per year.

Wet meadows used for hay production in the Sandhills are taxed at a little over a dollar per acre per year. If placed under irrigated corn production and reassessed accordingly, these taxes would increase anywhere from four to nine times. A similar situation occurs when Platte River wet meadows are likewise converted.

In the Rainwater Basin, taxes on wetland areas left as marshes where the farmer does not attempt to farm them may be as low as 20 cents per year. If drained or otherwise converted for irrigated corn production, taxes increase substantially (as much as ten dollars per acre per year).

In light of these findings, the existing property taxation system in Nebraska should not be an inducement to farmers to convert wetlands to more intensive agricultural use.

Land Manual Areas


Panhandle Area
1
North Central Area
2
Northeast Area
3
Southwest Area
4
South Central Area
5
Southeast Area
6
Eastern Area
7
SIOUX
DAWES
SHERIDAN
BOX BUTTE
SCOTTSBLUFF
MORRILL
GARDEN
BANNER
KIMBALL
CHEYENNE
DEUEL
CHERRY
KEYAPAHA
BROWN
ROCK
BOYD
HOLT
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
ARTHUR
McPHERSON
LOGAN
CUSTER
VALLEY
GREELEY
KEITH
LINCOLN
PERKINS
CHASE
HAYES
FRONTIER
DUNDY
HITCHCOCK
REDWILLOW
FURNAS
DAWSON
GOSPER
PHELPS
HARLAN
BUFFALO
KEARNEY
FRANKLIN
SHERMAN
HOWARD
HALL
ADAMS
WEBSTER
KNOX
CEDAR
DIXON
DAKOTA
PIERCE
WAYNE
THURSTON
ANTELOPE
MADISON
STANTON
CUMING
BURT
BOONE
PLATTE
COLFAX
DODGE
WASH
NANCE
MERRICK
POLK
BUTLER
SAUNDERS
DOUGLAS
SARPY
HAMILTON
YORK
SEWARD
LANCASTER
CASS
OTOE
CLAY
FILLMORE
SALINE
GAGE
JOHNSON
NEMAHA
NUCKOLLS
THAYER
JEFFERSON
PAWNEE
RICHARDSON

The names and numbers shown are used in the narrative portion throughout this Land Manual in referring to the various parts of Nebraska.

© Fred A. Herrington, State Tax Commissioner for the benefit of the State of Nebraska, August 1980.

Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 5

Rangeland Values

VALUES FOR LMA 1

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage Per Acre	.9	.8	.5	4	.3	.2
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$10.80	$9.60	$6.00	$4.80	$3.60	$2.40
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60
Landowners Income Except for Taxes	$9.80	$8.60	$5.20	$4.00	$3.00	$1.80
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$196.00	$172.00	$104.00	$80.00	$60.00	$36.00

How to Use Table

Calculate each column as follows. Use 1R as example, .9 AUM x $12 per AUM grazing fee gives income of $10.80/acre, subtract $1.00 expenses giving landowner income of $9.80/acre, divide $9.80 by 5% rent-to-value ratio for grassland gives the indicated land value of $196 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 1

VALUES FOR LMA 2

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.0	9	7	5	4	3
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$12.00	$10.80	$8.40	$6.00	$4.80	$3.60
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60
Landowners Income Except for Taxes	$11.00	$9.80	$7.60	$5.20	$4.20	$3.00
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$220.00	$196.00	$152.00	$104.00	$84.00	$60.00

How to Use Table

Calculate each column as follows: Use 1R as example, 1.0 AUM x $12 per AUM grazing fee gives income of $12.00/acre, subtract $1.00 expenses giving landowner income of $11.00/acre, divide $11.00 by 5% rent-to-value ratio for grassland, gives the indicated land value of $220 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 2.

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Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 59

VALUES FOR LMA 3

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Rental Share Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.2	1.0	.8	.7	.55	.4
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$14.40	$12.00	$9.60	$8.40	$6.60	$4.80
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60
Landowners Income Except for Taxes	$13.40	$11.00	$8.80	$7.60	$6.00	$4.20
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$268.00	$220.00	$176.00	$152.00	$120.00	$84.00

How to Use Table

Calculate each column as follows: Use 1R as example. 1.2 AUM x $12 per AUM grazing fee gives income of $14.40/acre, subtract $1.00 expenses giving landowner income of $13.40/acre, divide $13.40 by 5% rent-to-value ratio for grassland, gives the indicated land value of $268 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 3.

VALUES FOR LMA 4

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Rental Share Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.05	.9	.75	.55	.4	.3
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$12.60	$10.80	$9.00	$6.60	$4.80	$3.60
Landowners Expense per Acre	$1.00	$1.00	$.80	$.70	$.60	$.60
Landowners Income Except for Taxes	$11.60	$9.80	$8.20	$5.90	$4.20	$3.00
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$232.00	$196.00	$164.00	$118.00	$84.00	$60.00

How to Use Table

Calculate each column as follows: Use 1R as example, 1.05 AUM x $12 per AUM grazing fee gives income of $12.60/acre, subtract $1.00 expenses giving landowner income of $11.60/acre, divide $11.60 by 5% rent-to-value ratio for grassland, gives the indicated land value of $232 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 4.

Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 60

LEGAL CONSIDERATIONS REGARDING WETLANDS IN NEBRASKA

Nebraska Drainage Law (J. David Aiken)

Nebraska statutes and court decisions traditionally have given landowners wide discretion in draining wetlands. Natural resources districts (NRDs) have broad drainage authorities and state funds are available to drain wetlands. While more recently enacted environmental quality statutes authorize the State Department of Environmental Control (DEC) to regulate drainage activities, these haven't been used.

Drainage of diffused surface waters is one of the most heavily litigated areas of Nebraska water law [Yeutter, Diffused Surface Water Law in Nebraska, 41 Neb. L. Rev. 765, 1962; Thorson, Drainage of Diffused Surface Waters (St. Water Planning and Rev. Process Task Force Report to the Neb. Nat. Res. Comm., Nov. 1981)].

In its most recent drainage decision, the Nebraska Supreme Court defined "diffused surface water" as "waters which appear upon the surface of the ground in a diffused state, with no permanent source of supply or regular course, which ordinarily result from rainfall or melting snow " (Sullivan v. Hoffman, 207 Neb. 166, 172, 296 N.W. 2d 707, 711, 1980). Wetlands fall within this definition whether they are riparian wetlands, rainwater wetlands, or wetlands resulting from high water tables.

Landowners generally have the right to drain their land of unwanted diffused surface water, i.e., to drain their wetlands (Neb. Rev. Stat. sec. 31-201, 1978; Nichol v. Yokum, 173 Neb. 298, 263 N.W. 2d 437, 1962). A landowner has the right to drain his land even if the diffused surface water collects in natural or temporary basins "in the interest of good husbandry " (Nickman v. Kirschner, 202 Neb. 78, 82, 273 N.W. 2d 675, 678, 1979).

State statutes provide modest wetland protection regarding lake drainage. Lakes with a surface area of at least 20 acres at low water stage cannot be drained without a permit from the Nebraska Department of Water Resources if the lake is economically more valuable for fish culture or hunting than the lake bed would be for agriculture (Neb. Rev. Stat. Sec. 46-801, 1978). Smaller lakes are not subject to this permit requirement and presumably may be drained at will by landowners.

The major issue in Nebraska drainage law traditionally has been not whether landowners could drain unwanted diffused surface water, but whether they were liable for increasing the flow of diffused surface water onto lower landowners.

Owners of agricultural land may also dike their land to prevent unwanted diffused surface water from draining onto their land so long as it is in a purely diffused state and does not flow in a regular course (Nichol, supra.). However, the Nebraska Supreme Court in Nichol enunciated the "little watercourse rule" which says that if diffused surface water is collected in natural drainways and flows in a regular course, the water cannot be obstructed through dams or dikes.

In addition, Nebraska statutes authorize a large number of drainage authorities (Thorson, supra. at 1-9 to 1-11). However, the most significant modern drainage authorities have been given to natural resources districts. NRDs are given broad drainage authorities and taxing authorities to implement drainage projects (Neb. Rev. Stat. Sec. 2-3201, -3229, -3242, 1977 and Supp. 1980). Drainage projects can be financed through general NRD mill levy authority and in "project improvement areas" by additional levies against drained land (Neb. Rev. Stat. Sec. 2-3252 et seq., 1977). Drainage projects may also be funded through the Nebraska Resources Development Fund (Neb. Rev. Stat. Sec. 37-216.01 et seq., 1977).

Wetland Legal Protections

Nebraska water allocation statutes provide no direct protection for wetlands or subirrigation, except for the lake drainage permit requirement described previously. The Nebraska Supreme Court has ruled, however, that a landowner is entitled to compensation when his subirrigated land is drained by a canal [Luschinger v. Loup River Pub. Power Dist., 140 Neb. 179, 200 N.W. 549 (1941); see Aiken, Nebraska Ground Water Law and Administration, 59 Neb. L. Rev. 917, 947-48 (1980)].

As discussed earlier, Nebraska Supreme Court drainage decisions generally permit drainage of wetlands, but may require an upper landowner to pay money damages to a lower landowner damaged from drainage activities. It is unclear, however, whether a landowner would be entitled to compensation for wetland drainage or subirrigation drainage caused by irrigation well withdrawals. In most situations the surface and groundwater uses both would be for agricultural purposes and thus would enjoy the same preference status under Nebraska law. If the wetland use were not for agricultural purposes, it probably would not be legally favored because the Nebraska constitution affords a special preference to irrigation uses over all other non-domestic water uses (Neb. Const. art. XV, § 4. See Aiken, supra at 996-97). Thus Nebraska statutory law and common law does not provide much protection for preservation of wetlands and subirrigation.

An unsuccessful 1982 legislative proposal, LB 726, (introduced by Sen. Tom Vickers of Farnam) would have authorized natural resources districts (NRDs) to regulate groundwater withdrawals to protect surface water uses (presumably including wetlands) and subirrigation in groundwater control areas. Under existing law a groundwater control area may be designated by the Nebraska Department of Water Resources (DWR) at the request of an NRD to deal with groundwater depletion or groundwater pollution (Neb. Rev. Stat. § 46-658). LB 726 would have authorized control area designation if groundwater withdrawals threaten subirrigation or surface water uses within an NRD. If a control area were designated, the NRD could have been authorized to regulate groundwater development and use with DWR approval to prevent interference with subirrigation or surface water uses.

Subirrigation is often the result of a "full" groundwater aquifer. Thus, groundwater control area regulations designed to preserve subirrigation could have a considerable impact on irrigation development. Theoretically, extensive use of available groundwater supplies could be prevented to maintain a full groundwater aquifer. Because LB 726 could have dramatically slowed irrigation development in the Nebraska Sandhills region, it was successfully opposed by irrigation development interests in the 1982 Legislature. Senator Vickers has indicated, however, that he intends to introduce a similar proposal in 1983 if he is reelected to the Unicameral.

Interbasin Water Transfers and Wetlands Protection

In 1980, the Nebraska Supreme Court reversed a 44-year ban on interbasin surface water transfers in Nebraska. This has led to a race among irrigation development interests to acquire Platte River water rights for in-basin and out-of-basin irrigation uses. Interbasin transfer appropriations must be reviewed by the Nebraska Department of Water Resources (DWR) to see whether, considering both environmental and economic criteria, the state as a whole would be better off with the proposed project than without it. Also, all appropriations must be reviewed pursuant to the Nebraska Endangered Species Act to determine whether the proposed activity will interfere with the continued existence of endangered or threatened species or their habitat. If the proposed activity may interfere with such species or their habitat, the activity cannot be undertaken. While several Platte River irrigation proposals are pending, their ultimate implementation may hinge upon a greatly expanded state water development funding program.

The ban on transbasin diversions was based on the 1936 Nebraska Supreme Court decision of Osterman v. Central Neb. Pub. Power & Irr. Dist. (131 Neb. 356, 268 N.W. 334 (1936)). The Osterman prohibition of interbasin transfers protected wetlands to some extent in the Platte basin by preventing the development of irrigation projects which would have further reduced Platte River flows. Osterman was overruled in Little Blue NRD v. Lower Platte North NRD. (206 Neb. 535, 294 N.W. 2d 598 (1980)). In Little Blue, the Nebraska Supreme Court ruled that transbasin diversions of surface water were legal if the DWR director determined that such diversions were in the public interest.

Seven major irrigation projects have been proposed and project sponsors are competing furiously for Platte River water rights. Two Nebraska Supreme Court battles have been fought and at least one more is likely in the next two years. If any of these projects are developed, a significant impact on riparian wetlands may occur. Such an impact will need to be considered in making water-rights decisions regarding interbasin transfers, however.

In response to Little Blue, the 1981 Nebraska Unicameral defined the factors the DWR director is required to consider in making the public interest determination. If the state as a whole were better off without the diversion, considering both the economic and environmental impacts of the diversion, the appropriation would be denied. If the state would be better off with the diversion, the appropriation would be granted (Neb. Rev. Stat. § 46-289 (Supp. 1981)). This means that those opposing a particular project may participate in the hearing before the DWR, point out any wetland losses that may result from project implementation, and argue that the state is better off without the project than with it.

Nebraska Endangered Species Act

The DWR director will also have to evaluate the impact of the proposed irrigation project on the habitat of endangered or threatened wildlife species. On March 19, 1982, the Nebraska Supreme Court ruled that Neb. Rev. Stat. § 37-435(3), a provision of the Nebraska Endangered Species Act, requires the DWR director to consult with the Nebraska Game and Parks Commission (NGPC) to determine whether proposed surface water appropriations would interfere with the existence of threatened or endangered wildlife species or their habitat (Little Blue NRD v. Lower Platte North NRD, 210 Neb. 862, 317 N.W. 2d 726 (1982)). The court also ruled that the consultation requirement extended to political subdivisions of the state, such as NRDs, irrigation districts, etc.

The Endangered Species Act may directly or indirectly protect riparian wetlands in the Platte River basin. A large portion of the central Platte River area, including riparian wetlands, has been designated by the U.S. Fish and Wildlife Service as being critical habitat for the endangered whooping crane (50 C.F.R. § 17.11 (1980)). Wildlife proponents are likely to argue strongly that the proposed irrigation projects would adversely affect this critical habitat. If the NGPC concludes after consultation that a proposed irrigation project would not adversely affect endangered species or their habitat, the project would be approved by the DWR if it met the § 46-289 public interest requirements. If the NGPC concluded, however, that the irrigation project would adversely affect endangered species or their habitat, the project sponsor could modify the proposed irrigation project to avoid interfering with endangered species or their habitat, if this were possible or feasible. If the NGPC determined that the modified project still adversely affected the endangered or threatened species or their habitat, the DWR director as a practical matter would have to deny the irrigation project's application. It seems unlikely that the DWR director would rule that the project would not threaten endangered species after an NGPC determination that it would.

State Irrigation Development Financing

While the public interest review for interbasin transfer appropriations and the habitat review pursuant to the Nebraska Endangered Species Act may protect riparian wetlands in the Platte River basin regarding potential irrigation project development, these provisions do not guarantee wetland preservation. However, even if water rights are issued for these Platte River irrigation projects, financing must be obtained if the projects are to be implemented. This may be the biggest hurdle to irrigation project proponents.

Nebraska water laws have traditionally encouraged surface water development. Current statutes authorize organizing a variety of special purpose districts with broad financial and related authorities to develop major surface water reservoirs. In the past, these water projects have been financed principally by the federal government. Recently, however, federal officials have suggested that states and water users should bear a greater share of water project costs. To date, the Nebraska Unicameral has not made a state financial commitment to water development sufficient to offset loss of federal funds, although the Legislature has given bonding authority to a variety of districts for water development purposes.

Interest in surface water development has increased dramatically in Nebraska during the past two years and the competition for Platte River water rights and the associated water projects has led to concern regarding how these projects would be financed. LB 577 is a proposed constitutional amendment coming before Nebraska voters in November, 1982, which would allow the Nebraska Unicameral to authorize state revenue bonds for surface water projects. The Nebraska Constitution authorizes issuance of state revenue bonds for highways only. However, LB 577 may not provide a significant means for state financial support of surface water development because it is tied to the repayment capacity of water users. Traditionally, water users' charges have provided sufficient revenue for operation and maintenance of a water project only, with little or nothing being available for construction cost repayment.

Although voter approval of LB 577 may not provide adequate state financing of water projects, it could have a significant impact on how receptive the Legislature is to other water project financing proposals. Two unsuccessful 1982 legislative proposals would have earmarked one-half a percent and one percent of the state sales tax, respectively for water development purposes. This would generate approximately $40 million and $80 million annually. If federal matching funds were available, as seems likely, this would represent an aggressive state financial commitment to surface water development.

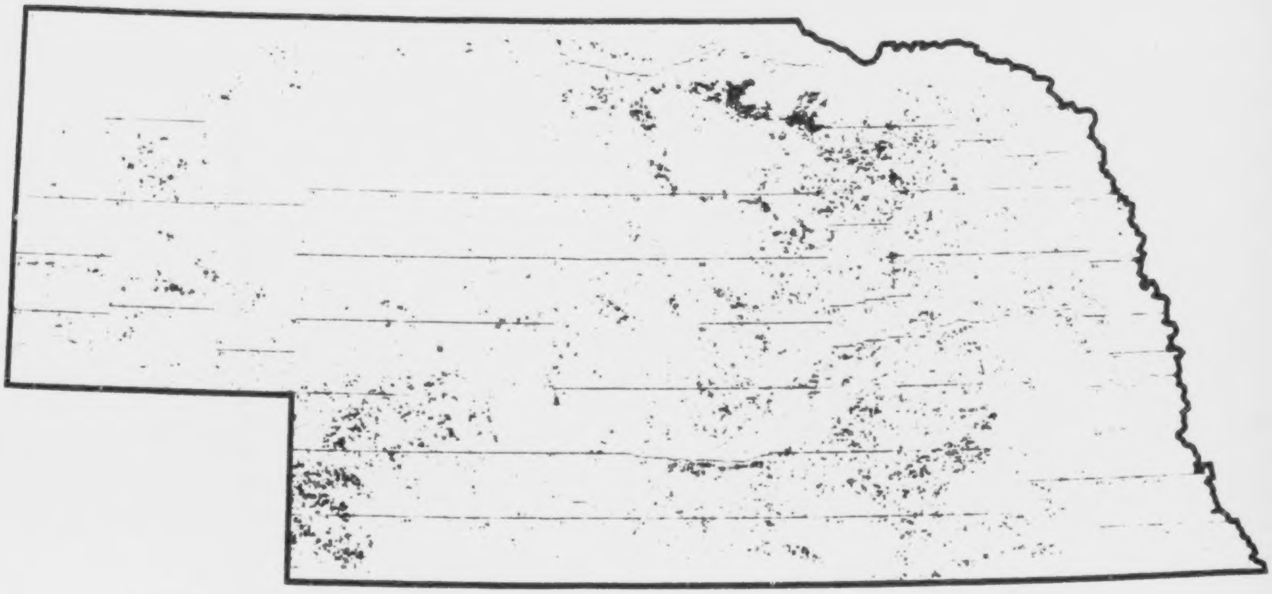
If LB 577 receives strong voter approval this November, water development advocates will press for legislation similar to these proposals. If the vote on LB 577 is close, or if it is defeated, water development advocates will be more cautious in promoting legislation establishing state financial support for water development. The decisions made regarding the financing of water development projects could have a greater impact on wetland preservation than could the Endangered Species Act or the public interest review required for inter-basin transfer appropriations.

Nebraska Environmental Protection Act

The DEC has broad statutory authority to establish regulatory programs to protect wetlands pursuant to the Nebraska Environment Protection Act (NEPA) (Neb. Rev. Stat. Sec. 81-1501 et seq., 1978). NEPA establishes that:

> It shall be unlawful for any person:
>
> (a) To cause pollution of any air, waters, or land of the state or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any air, waters, or land of the state; or
>
> (b) To discharge or emit any wastes into any air, waters, or land of the state which reduce the quality of such air, waters, or land below the air, water, or land quality standards established therefore by the Nebraska Environmental Control Council.

LOCATION OF CENTER PIVOT IRRIGATION SYSTEMS IN NEBRASKA (through 1980)



Source: Johnson and Pederson, 1982, p. 62

CENTER FIVOT INSTALLATIONS IN 17 SANDHILLS AREA COUNTIES*

Counties	1972[a]	1975	1980	Added in 1980
Northeastern Portion				
Brown	106	226	347	18
Garfield	4	16	108	31
Holt	695	1111	1737	76
Rock	131	230	456	34
Wheeler	47	128	376	108
Totals	983	1711	3024	267
Western Portion				
Arthur	0	22	46	13
Cherry	41	204	293	35
Garden	8	93	154	12
Grant	1	10	17	4
McPherson	4	27	75	22
Morrill	15	164	282	17
Sheridan	14	130	224	15
Totals	83	650	1091	118
Southwestern Portion				
Chase	233	621	943	73
Keith	25	105	223	27
Lincoln	94	308	672	76
Logan	4	34	88	27
Perkins	106	413	665	70
Totals	462	1481	2591	273

*not all of the counties nor the center pivots in them are strictly within the "Sandhills"

[a] first year center pivot inventory was made using remote sensing

Source: University of Nebraska Conservation & Survey Division

In recent years, the rate of growth in center pivot irrigation has tapered off due to higher interest rates, higher energy prices (center pivot systems are energy-intensive), and depressed farm prices.

Overall, the Sandhills' ecology has been suitably matched with the area's predominant land use for centuries as large herds of cattle slowly replaced large herds of buffalo and elk under man's development and control. Prevailing wetland systems of the region remained relatively stable. However, the presence of a massive, readily accessible, high quality groundwater reservoir has always offerred the potential for tremendous change in the Sandhills. This change is now occurring with the advent of center pivot technology.

The rolling terrain and sandy soils of the Sandhills pre-empted widespread irrigation development using gravity-flow techniques. With the refinement of these rotating sprinkler lines, immediate soil and terrain obstacles have been overcome. Many labor requirements associated with irrigation also are reduced or eliminated.

Because of the soils and topography involved, this development has been seriously questioned. A study process initiated two years ago by the State Natural Resources Commission (1981) identifies the following potential problems and concerns:

- "Blowouts" can develop rapidly if the surface cover is removed or destroyed. Cultivated cropland can have wind erosion losses of up to 300 tons per acre per year. (p. v) [March and April are the windiest months of the year in the Sandhills .. months when row crops are not yet established]
- Shallow stock and domestic wells near large scale developments have failed. Artesian wells have been adversely affected seasonally. Declining water tables have reduced the productivity of the "water level sensitive" wet meadows. [..] water table declines of as much as 40 feet in some areas of the Sandhills and further decreases in streamflow [are projected]. (p. vi)
- Irrigation of the sandy soils will introduce contaminants into the groundwater by leaching. (p. 2-7)
- Preliminary field data collected in some places . . indicates that yields have declined as organic matter in the topsoil has decreased after several years of cultivation. Lands adjacent to irrigation developments have also suffered economic losses. In some cases, the sand blown from irrigation lands has settled on adjacent rangeland and smothered the grass. (p. 1-13)

> - The Sandhills are a unique ecological resource. [..] The numerous lakes and wetlands within the grasslands attract a great diversity of shore and wading birds. The effects on the ecological balance of the shift from grassland to cropland habitat, and the loss of wetlands, are difficult to measure. (p. vi)

While participating in the development leading to these concerns, a majority of Sandhills residents believe that controls on irrigation development are necessary. In a poll of 800 residents in 1980, 68 percent of respondents indicated that water regulations and land use measures would be necessary. Over 70 percent felt that large-scale center pivot developments are threatening Sandhills resources (NRC, 1981, Appendix p. A1-1). A major concern is that some of the irrigation may be discontinued after the sandy rangeland has been put into row crop production.

Recent estimates by the University of Nebraska Conservation and Survey Division indicate that as much as 10 percent of some 5,437 center pivot systems installed in the Sandhills region have been abandoned or idled (news item, Lincoln Sunday Journal-Star, April 25, 1982). The explanation generally assumed for these abandonments or idlings is that many systems are simply proving to be uneconomical to operate, at least in recent years. State personnel with the U.S. Soil Conservation Service say that these idlings may leave as many as 54,000 acres of Sandhills land exposed to wind erosion (previously cited news item).

As irrigation growth has occurred in the Rainwater Basin and Platte Valley, marked destruction of wetlands has accompanied it. In the Rainbasin, wetland basins have been gradually drained and alterred to improve their accessibility for agricultural use. Construction of drainage ditches through wetland basins linked with a continually more effective regional drainage system (as provided through steady improvement of the rural road system) have led to the steady loss and deterioration of wetlands. In recent years, drainage of wetlands through installation of large water collection pits ("dugouts" or irrigation tailwater recovery systems) has frequently occurred.

While wet meadows, shallow flats and marshes, and other riparian wetlands in the Platte Valley have been directly impacted by land use and cropping changes in the area, wetland resources of the central Platte Valley also have been impacted by activities outside of the region. Groundwater levels in the Platte Valley and annual and seasonal streamflow levels of the Platte River are closely inter-related. Changes in one affect the other and cumulative changes in both over the years affect Platte riparian wetlands.

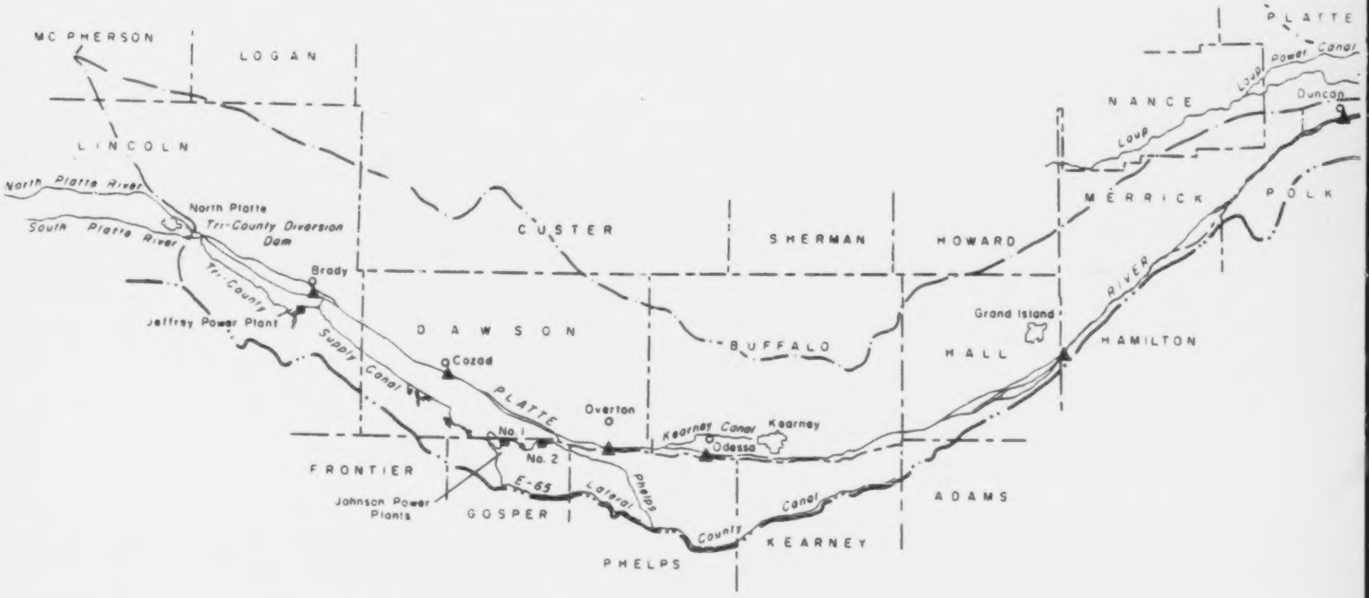
Past decisions governing the management of Platte River flows have had a significant effect on wetlands of the central Platte Valley. Upstream impoundment and diversion of North and South Platte River flows are chronicled in a recent report by Bentall (1982):

> The earliest recorded use of North Platte River water for irrigation was in the middle of the nineteenth century, but not until the 1880s did such use begin causing a large depletion of middle- and late-summer flows. Need to impound snowmelt runoff for summer use prompted the construction of Pathfinder Dam on the North Platte River in the early 1900s. Since then five other large dams have been built on the North Platte and one of its major tributary, the Laramie River, to store water and to regulate downstream flows advantageously for hydroelectric power generation and a large increase in irrigation. Lake McConaughy, the largest storage feature on the main stem, has a capacity of nearly 2 million acre-feet, and began filling in February 1941. Gray Rocks Reservoir on the Laramie River, completed in 1979, is the most recent storage feature to be created in the North Platte River basin.
>
> Use of water for irrigation in the South Platte River basin began in 1859, when a ditch diverting from Clear Creek in Colorado was dug. Building of the Denver Pacific Railroad spurred settlement of the valley and rapid expansion of irrigation. By the late 1870s, natural summer flows in most years had diminished to a trickle. Beginning in the 1880s, building of storage reservoirs proceeded at a rapid pace and by 1900 irrigation in the basin had about reached the present stage of development. Since 1946, water has been diverted from the Nebraska reach of the South Platte River and combined with water diverted from the North Platte River below Lake McConaughy for hydroelectric power generation (and, in recent years, also for cooling at a fossil-fuel electric power generating plant). (p. 9)

The result of these many water development activities on the North and South Platte Rivers is "a great change in the flow characteristics of some reaches and a reduction in the flow where the two rivers merge to form the Platte River" (p. 9). Once merged, the diversions immediately continue. Central Nebraska Public Power and Irrigation District has a major diversion site just downstream from the merging point. Nearly total diversion of Platte River flows can occur at this point at certain times but over the course of a year averages about 82 percent of flows (Bentall, 1982, p.9).

The diverted water flows through the Tri-County Canal system and irrigates around 127,000 acres in Gosper, Phelps and Kearney Counties. It also is used for some hydroelectric power production. The figure below shows the Platte River from slightly above the Tri-County Canal diversion site to the community of Duncan to the east in Platte County. Most of the area referred to as the central Platte Valley is contained in this stretch of river.

PLATTE RIVER BASIN


MC PHERSON
LOGAN
LINCOLN
North Platte River
South Platte River
North Platte
Tri-County Diversion Dam
Brady
Tri-County Supply Canal
Jeffrey Power Plant
CUSTER
DAWSON
Cozad
PLATTE
Overton
No. 1
No. 2
E-65 Lateral
Phelps
FRONTIER
Johnson Power Plants
GOSPER
PHELPS
County Canal
KEARNEY
Kearney Canal
Kearney
Odessa
SHERMAN
BUFFALO
HOWARD
HALL
Grand Island
ADAMS
HAMILTON
RIVER
MERRICK
POLK
NANCE
Loup
Loup Power Canal
PLATTE
Duncan

Source: excerpted from Bentall (1982), illustration 1

On the map, triangular symbols along the river indicate where state stream-gaging stations are in place (Brady in the west, Cozad, Overton, Odessa, Grand Island and Duncan). Below the Tri-County Diversion, several other smaller diversions occur supplying irrigation canals and water for hydroelectric power generation.

According to a recent study by the U.S. Fish and Wildlife Service (FWS, 1981), by the time the river reaches the Grand Island area in the central Platte Valley, about 70 percent of its annual flows are diverted irrigating nearly 2½ million acres of land. This leaves 800,000 to 1 million acre-feet in annual flows from an estimated predevelopment average annual flow of over 2½ million acre-feet (FWS staff interview, Grand Island Area Office, 1982).

Estimates derived from actual streamflow-gaging data collected since the 1930s at various points along the Platte are shown below (Bentall, 1982). The estimates are for the 1942-1980 period (after the filling of Lake McConaughy).

GAGING SITE	AVE. ANNUAL FLOW
Brady . . immediately below the Tri-County diversion	437,000 acre-feet
Cozad . . after six canals divert around 211,000 acre-feet	382,000 acre-feet
Overton . . after Tri-County returns some previously diverted waters to the Platte (507,000 acre-feet)	1,026,000 acre-feet
Odessa . . after diversions into the Kearney Canal and now abandoned Elm Creek Ditch	974,000 acre-feet
Grand Island . . after some water is returned from the Kearney Canal	986,088 acre-feet
Duncan . . to the east of what is commonly considered the central Platte area	1,073,000 acre-feet

The complexity associated with attempting to interpret these series of annual flow estimates in moving down the Platte River from west-to-east stems from the high inter-relationship between its flows and the area's groundwater system which is, in turn, heavily influenced by both groundwater and surface water irrigation throughout the region. Some flows find their way back into the Platte through the groundwater which were initially diverted for irrigation. At the same time, groundwater drawdown in some portions of the Platte Valley take waters from the Platte that would otherwise translate into downstream flows.

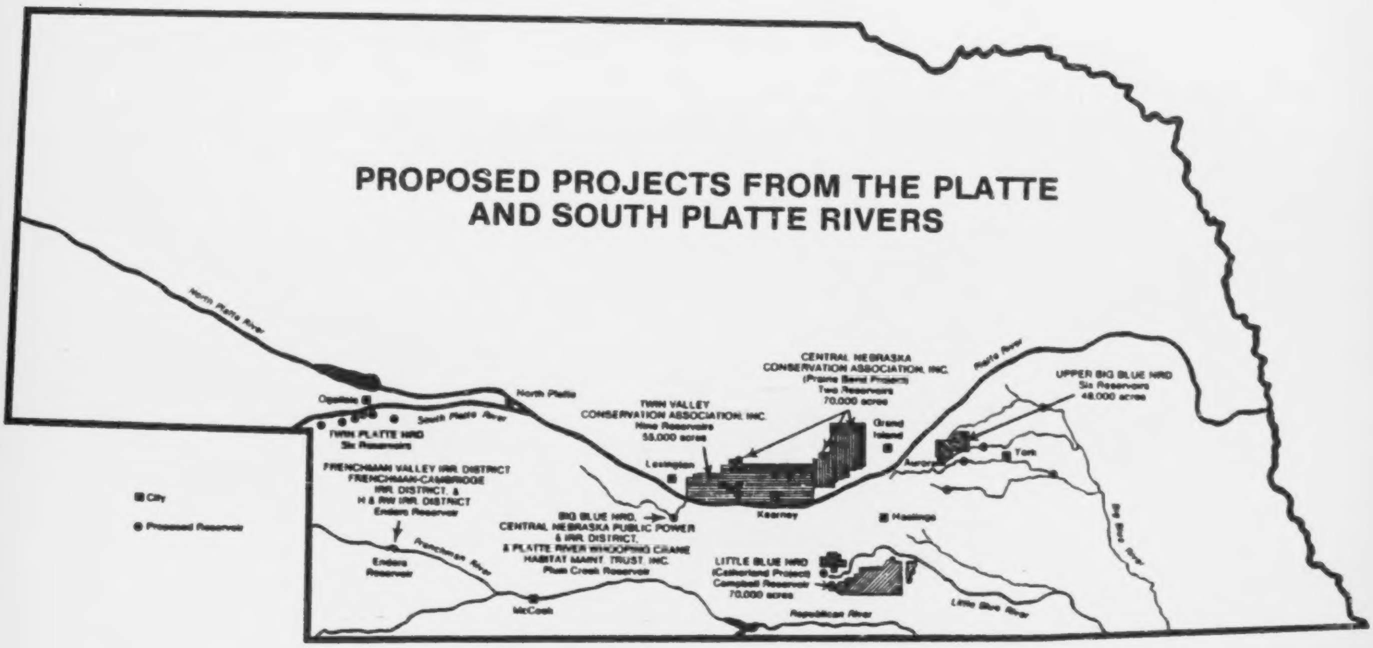
As a result of the reduction in overall streamflow amounts as well as the stabilization of streamflow resulting from upstream impoundments combined with the intensive groundwater irrigation development in the central Platte Valley, many wetland areas have been lost or significantly degraded in terms of their viability as wildlife habitat. While Platte River wetlands have been tremendously impacted by existing development utilizing its flows, considerably more development is being proposed. A list of proposed projects in Nebraska which would tap water from the Platte is shown on the following page. The amounts of Platte water that would be used (maximum possible amounts for each project that have been requested in project descriptions filed with the State Department of Water Resources) by the projects are also shown along with the diversion points where the water would be taken.

NEBRASKA WATER PROJECTS PROPOSED INVOLVING THE PLATTE RIVER

Project	Amount Requested	
Prairie Bend Project (Central Nebraska Conservation Association)	direct flow:	210,000 acre-feet
	storage:	352,000 acre-feet
	total	562,000 acre-feet
diversion point: Cozad-Overton stretch		
Catherland Project (Little Blue NRD)	direct flow:	199,500 acre-feet
	storage:	125,000 acre-feet
	total	324,500 acre-feet
diversion point: Cozad-Overton stretch, from Tri-County return flows		
Frenchman/Enders Reservoir (Frenchman Valley Irrig. Dist, Frenchman-Cambridge Irrig. Dist. & H&RW Irrig. Dist.)	storage: (total)	45,000 acre-feet
diversion point: South Platte River near Colorado border		
Twin Valley Conservation Association	direct flow:	165,000 acre-feet
	storage:	213,800 acre-feet
	total	378,800 acre-feet
diversion point: Cozad-Overton stretch		
Twin Platte NRD	storage: (total)	165,000 acre-feet
diversion point: South Platte River in Colorado		
Upper Big Blue NRD	direct flow:	144,000 acre-feet
	storage:	300,000 acre-feet
	total	444,000 acre-feet
diversion point: directly south of Chapman east of Grand Island		
Plum Creek Project (Upper Big Blue NRD, Central Nebraska P.P.& I. Dist. & Platte River Habitat Trust, Inc.)	storage: (total)	315,000 acre-feet
diversion point: impound Tri-County return flows & divert [illegible] of Platte south of Chapman east of Grand Island		

Source: Department of Water Resources, January 19, 1982

Together, the maximum amount of Platte water requested under the seven proposals exceeds 2 million acre-feet, over twice the remaining flow of the river. The service areas of the proposed projects are shown in the map below.


PROPOSED PROJECTS FROM THE PLATTE AND SOUTH PLATTE RIVERS
North Platte River
Ogallala
North Platte
South Platte River
TWIN PLATTE NRD
Six Reservoirs
FRENCHMAN VALLEY IRR. DISTRICT
FRENCHMAN-CAMBRIDGE
IRR. DISTRICT, &
H & RW IRR. DISTRICT
Enders Reservoir
Enders Reservoir
Frenchman River
McCook
City
Proposed Reservoir
TWIN VALLEY
CONSERVATION ASSOCIATION, INC.
Nine Reservoirs
55,000 acres
Lexington
BIG BLUE NRD,
CENTRAL NEBRASKA PUBLIC POWER
& IRR. DISTRICT,
& PLATTE RIVER WHOOPING CRANE
HABITAT MAINT. TRUST, INC.
Plum Creek Reservoir
CENTRAL NEBRASKA
CONSERVATION ASSOCIATION, INC.
(Prairie Bend Project)
Two Reservoirs
70,000 acres
Grand Island
Kearney
Hastings
LITTLE BLUE NRD
(Catherland Project)
Campbell Reservoir
70,000 acres
Republican River
Platte River
UPPER BIG BLUE NRD
Six Reservoirs
48,000 acres
Aurora
York
Big Blue River
Little Blue River

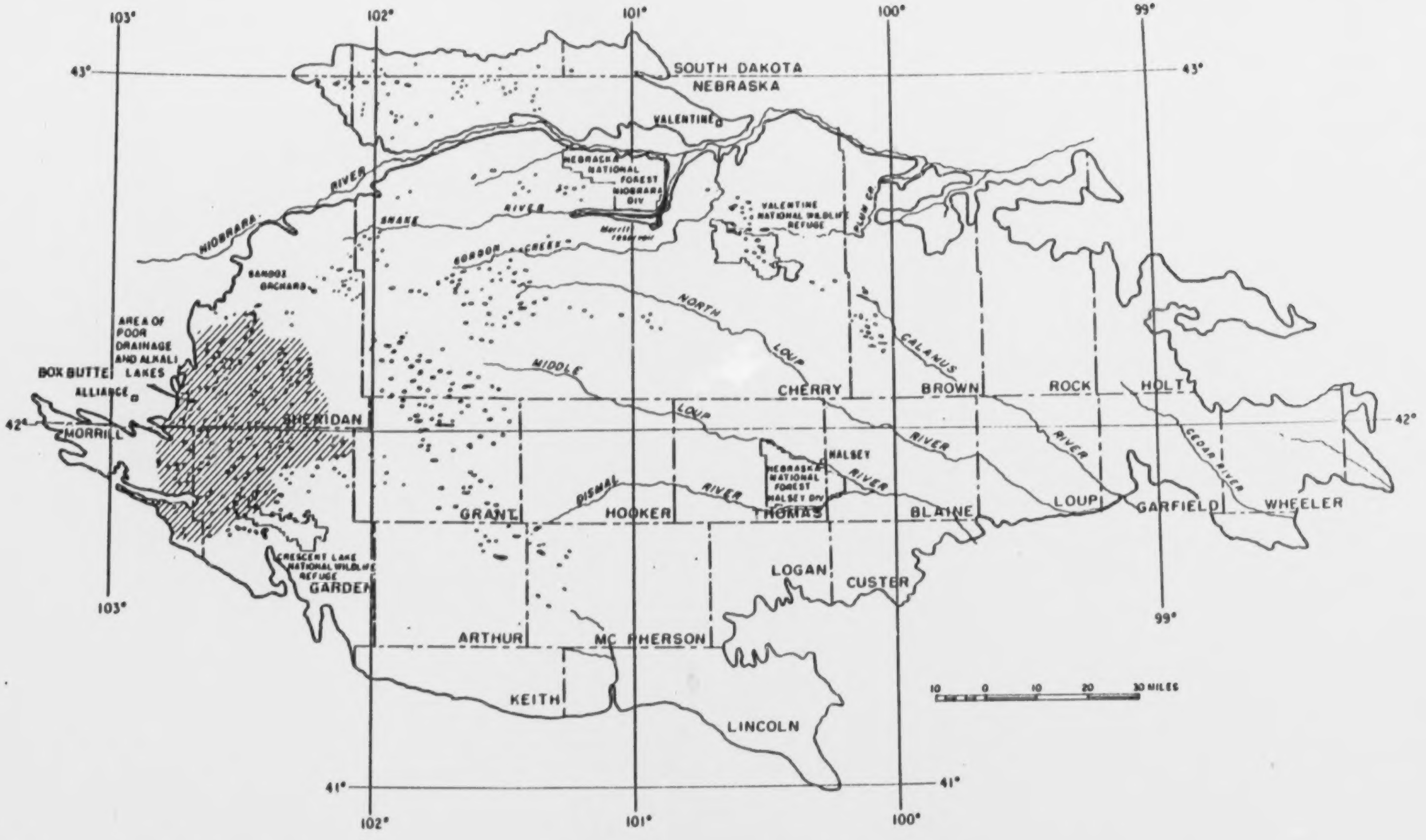
Source: Department of Water Resources, August, 1982

Several of the projects would divert or impound water on the Cozad-Overton stretch. The Prairie Bend project, the largest of these, proposes to divert up to 562,000 acre-feet annually which represents 110 percent of the average amount returned at this point on the river from the Tri-County Canal and 55 percent of the average annual flow at Overton. The Twin Valley project request amounts to 75 percent of Tri-County return flows and 37 percent of Platte annual flows at Overton. The Catherland Project would take 64 percent and 32 percent of the same respective average annual streamflow amounts.

The Plum Creek Project also would use Tri-County return waters but instead of diverting them from the Platte River at this point, would impound them in the Plum Creek basin and release them into the Platte throughout the year according to need. Under this project, water from the Platte would not actually be diverted from the river until after it had passed through most of the central Platte Valley (diversion site is south of Chapman east of Grand Island). Plans are to in part manage the impounded water from the Tri-County Canal system in order to attempt to maintain Platte River habitat downstream from Overton.

It is quite obvious that remaining flows of the Platte River cannot accommodate all of the projects being proposed. It is equally obvious that each of the projects will have differing impacts on the Platte River and the remaining wetland areas it helps sustain. Pressure is being put on the State of Nebraska to proceed with some of these projects by proposals for additional use of flows of both the North and South Platte Rivers in other states. For example, the Narrows Irrigation Project proposed in Colorado would cut average annual flows into Nebraska from the South Platte River by about a third or 100,000 acre-feet according to the Bureau of Reclamation (news item, Lincoln Journal, July 22, 1982). Some return flows from the project to the South Platte may occur.

A "Conflict-resolution Project" was recently initiated in the state to attempt to address and resolve the inherent conflicts presented by the multitude of proposals for additional diversion and use of Platte River flows. The project is being coordinated by the Nebraska Natural Resources Commission with funding assistance from the federal government. Part of this study process will address the implications of various proposals for managing Platte River flows on the viability of Platte River wetlands.


103°
102°
101°
100°
99°
43°
42°
41°
SOUTH DAKOTA
NEBRASKA
VALENTINE
NEBRASKA NATIONAL FOREST NIOBRARA DIV
VALENTINE NATIONAL WILDLIFE REFUGE
NIOBRARA
RIVER
SNAKE
RIVER
GORDON CREEK
Merritt reservoir
PLUM CR.
SANDOZ ORCHARD
AREA OF POOR DRAINAGE AND ALKALI LAKES
BOX BUTTE
ALLIANCE
MORRILL
SHERIDAN
NORTH
LOUP
CALAMUS
MIDDLE
LOUP
RIVER
CHERRY
BROWN
ROCK
HOLT
RIVER
CEDAR RIVER
HALSEY
NEBRASKA NATIONAL FOREST HALSEY DIV
RIVER
DISMAL
RIVER
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
CRESCENT LAKE NATIONAL WILDLIFE REFUGE
GARDEN
LOGAN
CUSTER
ARTHUR
MC PHERSON
KEITH
LINCOLN
10 0 10 20 30 MILES

MAP SHOWING THE SANDHILLS REGION OF NEBRASKA (Source: Dunes of the Plains, Resource Report No. 4, University of Nebraska Conservation and Survey Division, 1978 reprint, p. 3)

NEBRASKA WETLAND TRENDS

WETLANDS DISTRIBUTION IN NEBRASKA . . PAST AND PRESENT

Introduction and Overview

The major wetland areas of Nebraska, the Rainwater Basin, Sandhills region and Platte River valley; illustrate different but related rates of change in their distribution and current condition. Their functions are somewhat different but inter-related as well.

The Platte River valley is a staging area for approximately 80 percent of the sandhills crane population of North America (U.S. FWS, 1981) as well as critical habitat for whooping cranes, an endangered species. The Rainwater Basin shares with the Platte a major role as an area of use for migratory waterfowl including several species of ducks and geese. Ninety-five percent of the overall population of white-fronted geese reportedly use these areas. Sandhills wetlands are also significant habitat for migratory birds including waterfowl and shore birds. They also serve upland game and furbearers and where "subirrigated meadows" are present, provide an invaluable hay crop for livestock raised in the area.

Each area is experiencing continuing trends and influences which alter the condition and distribution of wetlands. In many ways, these trends are associated with the development of irrigated cropland although other influences are present as well. Loss and deterioration of wetlands are critical in the Rainwater Basin and Platte Valley areas and potentially critical in the Sandhills.

Expansion of cropland aided by drainage, reduction of wetland size through concentration of water in dugouts or pits, and leveling and alteration of surface drainage patterns influence wetlands in the Rainwater Basin. Upstream impoundment and diversion of water for irrigation and power, conversion of riparian wet meadows to cropland, and lowering (seasonal and long term) of water tables by irrigation have impacted Platte River wetlands. In the Sandhills, some direct drainage and leveling as well as seasonal and potential long-term groundwater drawdown from the expansion of irrigated agriculture into the region are affecting wetlands in the area particularly in the east.

Background Studies and Classifications Used

Concerted efforts to inventory Nebraska wetlands began with a 1950 inventory by the U.S. Fish and Wildlife Service (FWS, 1955), although Nebraska was included in some earlier efforts by the U.S. Department of Agriculture in 1906, 1922, 1940 and 1953 (Shaw and Fredine, 1956). Studies over the last 20 years include one by the Nebraska Game and Parks Commission (NGPC) in the 1960s of both the Rainwater Basin and Sandhills area (NGPC, 1972). The NGPC survey was updated for 10 of 17 Rainwater Basin counties in 1981 (NGPC, 1981).

Remote sensing studies have been done to both inventory wetlands and test the applicability of remote sensing capabilities in identifying wetlands. Inventories were done by Seevers, et.al. (1975), and Rundquist, et.al. (1981), the latter producing a "Wetland Atlas" for the Omaha District Corps of Engineers. Others include Gilbert, Freel and Bieber (1980) and Turner and Rundquist (1980).

Additional case studies continue as do field studies by staff of the Conservation and Survey Division of the University of Nebraska and other branches of the University and state and federal agencies.

Wetland classifications, size categories used and study objectives vary between studies as do study areas and emphasis of findings. The earlier classification system of the Fish and Wildlife Service ("Circular 39," Shaw and Fredine, 1956) is utilized in the 1950s inventory (FWS, 1955) and in the Game and Parks Commission inventories (NGPC, 1972 & 1981). Nebraska wetlands are described according to 5 of 20 possible categories outlined in Circular 39 including:

Type I . . .	seasonally flooded basin or flat
Type II . . .	inland fresh meadows
Type III . .	inland shallow fresh marsh
Type IV . . .	inland deep fresh marsh
Type V . . .	inland open fresh water

Remote sensing studies primarily utilize various "marsh" categories, "subirrigated meadow" and "open water." Problems of inclusion of impounded open water and flowing streams and omission of seasonally flooded areas can result in using these latter categories. No inventories have yet used the new FWS classification system (FWS, 1979 & Cowardin, 1982). It utilizes hierarchies of classes and other descriptors. Nebraska wetlands would fall within the Palustrine, Lacustrine and Riverine systems with further classification by relations to other bodies of water, persistence, soil and vegetation, water regime and water chemistry.

For purposes of this discussion, general verbal descriptors will be used which correspond to the Types I-V of Circular 39. These are all variations on Palustrine systems except for riparian (Riverine) systems and significant open water areas (Lacustrine), or littoral classes of wetlands adjacent to lakes.

Relative to size categories used in the various studies, Seevers, et.al. (1975) investigated wetlands greater than 10 acres. The Rundquist (1981) remote sensing inventory worked with a resolution of 1.12 acres using Landsat technology available at the time. Sampling techniques, field inventorying, use of aerial photography, maps and other devices for checking findings all account for variations in wetland estimates.

The same is true for study orientation. The Fish and Wildlife Service and Game and Parks Commission inventories reflect an interest in viable wildlife habitat. Remote sensing studies while indicating "wet" areas don't attempt to assess the viability of these areas as wildlife habitat. They are simply attempts to produce basic wetland inventories for use in administering regulatory programs (Section 404) and monitoring change. Seasonal and longer term climatic variation, discrepancies in definition of categories, and variation in the policy and methodological orientation of study participants may also account for assessment differences as is the case with all studies.

Dynamic aspects of wetland hydrology cloud the findings of all of the studies as well. This is reflected in a reference made by Winter and Carr (1980) to the Prairie Potholes of North Dakota but applicable to Nebraska wetlands as well:

> [There are] complex inter-relationships of wetlands and groundwater . . . Some wetlands appear to recharge groundwater, some wetlands are flow-through types where groundwater enters one side and surface water seeps into the ground on the other side and some wetlands are discharge points for groundwater. Further, these inter-relationships vary throughout the year. [. .] The hydrology of prairie wetlands remains one of the least studied [and understood] hydrologic features of the prairie landscape. (pp. 1-2)

While groundwater levels are generally closely linked to the presence of Sandhills wetlands, considerable complexity exists concerning this relationship (Ginsberg, personal communication, 1982; Pederson, personal communication, 1982). In addition, a definitive understanding of the hydrology of Rainwater Basin wetlands is also lacking.

Wetland Distribution and Trends in the Rainwater Basin

The Rainwater Basin wetlands of southcentral Nebraska are primarily characterized by the interaction of water and soil in depressions whose specific geological origins are uncertain (Pederson, personal communication, 1982). Much of the area is flat to gently rolling and excess water from heavy precipitation tends to collect in these depressions rather than being carried off in streams or waterways.

> Water accumulations in these depressions caused a leaching and concentration of clay in the subsoils ranging in thickness from six inches to six feet. When wet, the soil is nearly impervious to water. [. .] Basin soils are fertile and shallow and extremely subject to flooding and drouth due to the restricted water holding capacity of the thin layer of soil over the impervious claypan. (NGPC, 1972, pp. 2-3)

Soils which surround the depressions are generally deep and fertile silty loams. In dry years, some wetlands remain dry during much or all of the growing season. Periodically, ordinarily wet areas in the spring are dry and may be tilled and cropped. Smartweed and other emergent vegetation characterize these areas in wet years (NGPC, 1972).

The first study by the Game and Parks Commission of the region identified wetland changes in relation to a baseline "original condition." This original condition of wetlands was developed from 1920s county soils maps. Hence, an attempt was made to neutralize much of the effect of short term wetland dynamics (dry periods and wet periods, etc.) in determining where wetlands historically were present as ultimately reflected in soil conditions. A recently updated survey by NGPC also uses this benchmark for estimating change. The latter update, however, only includes ten of the original 17 Rainwater Basin counties included in the earlier survey.

A dramatic loss and deterioration of wetland basins largely involving areas smaller than average is noted in the 1960s NGPC survey. Overall, 82 percent of the region's original basins were considered lost through usage. Sixty-five percent of the original wetland acreage was estimated to be lost including some on wetlands which remained; a nearly two-thirds loss of over 60,000 acres.

The 1981 update for 10 counties showed a continuation of this trend. For the 10-county area, the 19 percent of original basins remaining in the 1960s were reduced to about 10 percent of the original number (NGPC, 1982). While 35 percent of the original acreage was considered "remaining" in the 1960s, roughly 17 percent remained in 1981 (NGPC, 1982). NGPC estimates compiled in these two surveys are summarized in the table below.

TABLE 1: 17- AND 10-COUNTY RAINWATER BASIN WETLAND SURVEYS, 1960s & 1981

	Number of Basins	Acres	Ave. Acres/Basin
original historical distribution of wetlands (17-county area)	3,907	94,041	24.1
	82% reduction	65% reduction	
1960s distribution of wetlands (17-county area)	685	32,529	47.5
individual basins "lost"	3,222	36,830	11.4
acres "lost" through additional wetland reduction		24,700	36.1 (loss/basin)
original historical distribution of wetlands (10-county area)	2,279	59,560	26.1
	81% reduction	65% reduction	
1960s distribution of wetlands (10-county area)	437	20,663	47.3
	49% reduction	50% reduction	
1981 distribution of wetlands (10-county area)	225	10,232	45.4
	90% reduction in areas	83% reduction in acres	

SOURCE: Nebraska Game and Parks Commission, 1972 and 1981

It can be noted that most of the loss of basins through the 1960s involved areas averaging a little over 11 acres in size (11.4). As a result, remaining wetland basins in the 1960s averaged over 47 acres in size, nearly twice the average size of baseline estimates. This occurred even with an estimated reduction in size of remaining wetlands of around 24,700 acres or approximately 36 acres per basin. This suggests that the basins remaining in the 1960s averaged over 83 acres in size historically (as determined from soils maps).

The ten counties included in the 1981 update contained roughly

58 percent of the original wetland basins estimated for the 17-county area and 63 percent of the original wetland acres. Estimates indicate a continuation of the earlier trend in wetland loss. Reduced by about 81 percent through the 1960s, the area experienced a further reduction in basins of 49 percent through 1981 or nearly half.

With much of this additional loss affecting the larger basins that remained in the 1960s, the average number of acres per basin actually shrunk from 47.3 to 45.4 according to the estimates. Overall wetland acreage reduced by 65 percent through the 1960s was cut in half by 1981.

Hence, for the ten-county area, roughly 10 percent of the estimated original wetland basins remain accounting for about 17 percent of the original wetland acreage according to the NGPC estimates. Of this remaining acreage, NGPC estimates that 43 percent is under either federal or state ownership (NGPC, 1981).

Data on wetland basins and acreage is presented by county in Table 2 (following page). Besides NGPC estimates, the table includes figures from the "Wetland Atlas of the Omaha District Corps of Engineers" (Rundquist, et.al., 1981).

On a county level, the estimates vary considerably. Categories used in the "Wetland Atlas" were "open water" and "marsh." "Riparian" and "subirrigated meadow" were excluded. Acreage totals are high in some cases and low in others in relation to the 1981 NGPC figures. Impoundments including reservoirs and canals and farm ponds (of which there are many), all of which are included in the open water classification, probably account for much of the higher estimates.

Under-estimation and precipitation variations may account for lower estimates in the "Wetland Atlas" which would exclude some seasonally flooded basins. One-third of the wetland areas inventoried in the 1981 NGPC survey are seasonally flooded basins averaging 13.2 acres in size.

Tables 3 and 4 indicate the size distribution of wetlands lost from the original distribution to the 1960s and the distribution of wetland areas by type in the 10-county area in the 1960s and 1981. Although some larger, more permanent wetland areas have been lost or have deteriorated, the tables suggest that smaller, more seasonally dynamic wetlands are most susceptible to change.

TABLE 2: WETLAND DISTRIBUTIONS BY COUNTY (NGPC, 1972 & 1981, "Wetland Atlas," 1981)

	"Original" (NGPC 1972)		1960s (NGPC 1972)		1981 (NGPC 1982)		1981 "Wetland Atlas" Acres*		
County	Basins	Acres	Basins	Acres	Basins	Acres	Marsh	Open Water	Total
Adams	97	2237	16	550	11	393	317	197	514
Butler	327	3513	23	1126			425	576	1001
Clay	858	19411	217	9213	110	5633[a]	1022	439	1461
Fillmore	622	21038	118	5663	59	1856	1162	80	1242
Franklin	105	2689	14	1753	8	895	206	320	526
Gosper	156	2536	28	1426	14	807	144	2286	2430[b]
Hall	18	801	11	620	4	22	260	2375	2635[c]
Hamilton	290	7768	20	925	12	462	119	701	820
Harlan	36	1058	5	372			489	13322	13811[d]
Kearney	133	2961	29	1711			249	384	633
Nuckolls	44	977	6	324	3	11	62	229	291
Phelps	56	5966	40	3453			347	620	967
Polk	227	4173	33	752			95	449	544
Saline	78	1285	5	124	2	23	170	41	211
Seward	177	5316	12	670			484	375	859
Thayer	11	818	2	65	2	30	40	6	46
Webster	3	-	0	0					
York	672	11494	106	3782			419	222	641
Totals (17)	3910	94041	685	32529			6010	22622	28632
(10)	2279	59560	437	20663	225	10132	3502	6674	10176

[a] includes many wetlands that are seasonally dry or dry over several years and cultivated intermittently

[b] contains Elwood Reservior with 1,040 surface acres as well as Johnson Reservoir

[c] includes parts of the Platte and Wood Rivers

[d] contains the Harlan County Reservoir with 13,240 surface acres

[e] includes parts of the Republican and Little Blue Rivers

*figures have been rounded to the nearest whole number

TABLE 3: SIZE DISTRIBUTION OF "ORIGINAL BASINS LOST" THROUGH THE 1960s

	under 10 acres	10-25 acres	26-50 acres	51-100 acres	over 100 ac.
Number of Basins Lost	2253	744	135	54	34
Percent of Original Distribution	69.9	23.2	4.2	1.7	1.1

Source: Nebraska Game and Parks Commission, 1972

TABLE 4: DISTRIBUTION OF WETLANDS BY TYPE, 1960s, 1981, FOR TEN RAINWATER BASIN COUNTIES

	seasonally flooded basins			shallow marshes			deep marshes		
	1960s	1981	change	1960s	1981	change	1960s	1981	change
Number of Basins	210	70	(-66.7%)	138	100	(-27.5%)	81	55	(-32.1%)
Acres	4997	926	(-81.5%)	8142	4927	(-39.5%)	7083	5436	(-23.3%)

Source: Nebraska Game and Parks Commission, 1981

Some shifts between types of wetlands take place as well: conversion of seasonally flooded basins to smaller deep marshes by deepening areas to concentrate surface water and reduction in size of marshes to make them effectively seasonally flooded areas (NGPC, 1981).

In general, Rainwater Basin wetlands are and have been greatly affected by variations in precipitation accentuated by closely associated alteration and reduction by human activities.

Activities Causing Wetland Changes in the Rainwater Basin

Most activities affecting wetlands in the Rainwater Basin are associated with the expansion of cropland in general, irrigated cropland in particular, and associated land treatment and management practices. The NGPC 1960s survey links approximately 70 percent of wetland loss and deterioration to drainage activities and about 19 percent to leveling (NGPC, 1972). The remainder is tied to activities which in one way or another alter surface drainage patterns and the size of drainage areas which sustain wetland areas.

Fish and Wildlife Service staff suggest two phases of change in the Rainwater Basin (FWS consultation, 1982, Grand Island). The first commenced with settlement and development of the area by immigrants up until the 1950s and early 1960s and involved drainage projects and leveling activities associated with agricultural development and road construction (which segmented and sometimes filled wetlands). The second phase of wetland deterioration derives from the reduction and partial drainage of wetlands through the construction of "dugouts" or irrigation reuse pits. These and similar practices concentrate surface waters in wetland depressions reducing their extent and overall biological diversity. At the same time, water saturation levels in the soils surrounding the dugouts are reduced and overall access to the wetland area is improved for agricultural purposes. The tremendous amount of sediment and clay taken from the dugouts during their construction also serves the dual purpose of providing fill material.

Activities affecting Rainwater Basin wetlands are further discussed below:

1. Drainage associated with cropland expansion: Efforts to expand land parcels for irrigation development have stimulated drainage of some wetland areas and are a continu-

ing source of pressure. Drainage has been consistently practiced, including before the turn of the century, although the Rainwater Basin has not experienced the large-scale public (county) drainage projects which characterized the Dakotas and Minnesota (Harmon, personal communication, 1982). Drainage ditches and tile drains have been used to reduce or alter wetland areas (NGPC, 1972). Recent activities include irrigation reuse pits designed to hold irrigation water on the unit of land irrigated (which is required by law). Most wetland loss or deterioration in recent years is directly related to intensified or expanded farming.

2. Leveling of wetlands associated with cropland expansion: In smaller wetland areas where a Scott silt loam (a water-retaining soil) is surrounded by a Fillmore silt loam and then by a deeper Hastings silt loam; filling of wetlands can be accomplished by leveling the basin with the deeper soil, thus creating usable tillable land (Schildman, personal communication, 1982). Occasional instances of accelerated erosion causing some filling of small basins have been noted.

3. Drainage associated with roadside ditches: Alteration of surface drainage through the deepening of roadside ditches and historically through the extension of county section roads through wetlands have both affected wetlands by alterring drainage patterns and filling. Explicit draining of wetland areas with roadside ditches has occurred as well (NGPC, 1972).

4. Public works projects: Some wetlands have been affected by several types of public works projects. Reservoirs have partially displaced shallow wetland areas as have irrigation canals (NGPC, 1972).

Wetland Distribution and Trends in the Sandhills

Like the Rainwater Basin, Sandhills wetlands play a very significant role as habitat for migratory birds including ducks, geese and shore and wading birds. These wetlands are particularly important for waterfowl breeding (Nebraska Natural Resources Commission, 1981). They also support fish populations and numerous terrestrial species. Wet meadows are extensive in some parts of the Sandhills and are vitally important as a source of hay for cattle produced in the area. Other wetland types found are shallow and deep marshes and open water areas.

In describing wet meadows, Keech and Bentall (1978) say:

> Valley flats where groundwater is within reach of roots sustain luxuriant stands of tall grasses that generally remain green until fall. Such valleys are referred to as "wet valleys" or "subirrigated meadows." (p. 7)

Areas of exposed groundwater and larger and deeper marshes are distributed in various concentrations throughout the Sandhills, but are particularly found in the east. In the western part of the Sandhills are numerous "closed basin" lakes. These are . .

> . . maintained by overland runoff rather than by inflow of groundwater. Some of the lakes receive inflow from the eastward sloping tableland west of the Sandhills area and fine-grained sediment suspended in the inflow has contributed to the formation of the nearly impervious seal that floors the lakes. Unlike most Sandhills lakes which contain fresh water, these contain water that is slightly to strongly alkaline. (Keech and Bentall, 1978, p. 15)

Emergent aquatic plants are found in all but the most alkaline wetlands (NGPC, 1972). Hydrologic characteristics of Sandhills lakes and wetlands are generally assumed to be closely connected to groundwater levels (except in the closed basin areas). Detailed studies of the specific nature of these relationships are currently underway (Ginsberg, personal communication, 1982).

Sandhills wetlands are a large and widely distributed resource and present different problems of estimation. Field inventories are difficult due to distances involved and lack of accessibility on large ranches. Hence, inventories vary considerably.

The extent of Sandhills wetlands appears stable over the early decades of this century largely because of the dominance of a ranching economy. However, noteable change has occurred in the last 15 years which accelerated somewhat through the seventies. This change is tied to expansion of irrigation particularly in areas of the eastern Sandhills.

The Game and Parks Commission 1960s inventory estimated that slightly over 15 percent of the original wetland acres in the Sandhills had been lost. Less than one percent of the original basins had been lost in recent years leading up to the 1960s (NGPC, 1972). Even this somewhat low loss estimate was overstated, however, since wet meadow areas and acreage were grossly under-estimated in the survey (as NGPC acknowledges).

Rundquist (1982) reviewed Sandhills inventories since 1950 and compared estimates by category. Selections from his review are presented in Table 5.

TABLE 5: SANDHILL WETLANDS ESTIMATES

	ACRES				
Source:	wet meadows	shallow marshes	deep marshes	open water	totals
U.S. FWS, 1955	404,267	43,105	90,844		637,198
NGPC, 1972	28,109	28,498	38,786	59,988	155,381
"Wetland Atlas"	1,130,954	64,521		112,478	1,307,953

Marsh estimates by NGPC and in the "Wetland Atlas" are reasonably close (66,895 versus 64,521). FWS totals for shallow and deep marshes approximate NGPC totals for marshes and open water (133,949 versus 127,272). According to Rundquist (personal communication, 1982), there is general agreement on the order of magnitude of wet meadows in the Sandhills. NGPC also suggests that a carefully applied estimate of wet meadows in the Sandhills would approximate about one million acres (estimated at 1,130,954 acres in the "Wetland Atlas").

A great deal of the variation can be explained by: under-estimation of wet meadows in the eastern Sandhills in the NGPC 1960s inventory, inclusion of large areas of open water in the "Wetland Atlas" which are impoundments, and sampling of wetlands in the 1950s Fish and Wildlife Service inventory. Differences in methodology and the degree of resolution (1.12 acres) in the Landsat system contribute to differences as well.

Distributions by size are only available in the NGPC survey. Although not representative of wet meadows, this earlier period appears to have been characterized by a somewhat more even distribution by size of wetlands considered lost or deteriorated. Of 184 areas described as lost from the original distribution, 37 were between 100 and 200 acres, 43 were between 200 and 400 acres and 13 exceeded 400 acres in size.

These data don't accurately reflect more recent trends in the Sandhills which indicate loss and deterioration of smaller marsh and wet meadow areas (largely tied to irrigation development). The convergence of influences threatening Sandhills wetlands particularly in selected areas is well recognized. Recent research and policy inquiries point out the need to study uses being made of groundwater in the Sandhills and the impacts this is having (NRC, 1981; see also Christian, 1982, for expanded discussion of subirrigated meadows and monitoring techniques).

Activities Responsible for Changes in Sandhills Wetlands

Earlier long term trends prior to the middle and late 1960s reflect drainage of a few relatively large areas in some cases to expand hay production. Current trends reflect the relatively recent but rapid development of center pivot irrigation. Water table declines of as much as 40 feet are being projected for some areas of the Sandhills under current development trends (NRC, 1981, p. vi). Concerns revolve around the effect of long term drawdown as well as induced movement of groundwater on those wetlands hydrologically tied to the level of groundwater. These activities are further discussed below:

1. Expansion of irrigated cropland (converting rangeland and related impacts): Development of center pivot irrigation particularly in the eastern Sandhills area has sometimes led to drainage of wet meadows through pumping water into other drainage areas, thus lowering the water table in the area of a wetland. Extensive center pivot irrigation development which results in local and larger regional declines in groundwater levels would adversely impact even wetlands not directly converted to irrigated cropland with the full impact depending on specific hydrological conditions.

   While Sandhills groundwater supplies are extensive, the sensitivity of Sandhills wetlands is such that some relatively small declines in the water table may impact on wetlands. Thus, even seasonal and short term effects on the water table will affect the condition of wetlands.

2. Direct drainage using ditches: NGPC (1972) notes evidence of wetland loss using ditches often within a large parcel of land under a single owner. This was generally to expand hay production into wetter areas. Instances of this activity appear to have been largely in the western Sandhills. For one of these counties (Grant), NGPC (1972) notes: ". . approximately 56 percent (10,654 acres) of the county's wetland acreage and about 18 percent (64) of the total wetland number have been destroyed. The frequency of drainage in Grant County is greater than that of any other county in the Sandhills. Larger Type IV and V wetlands have been the chief targets. Ditching has been the principal method used although pumping methods have been employed . . Although drainage by pumping is usually not permanent it often destroys the wetland's value to waterfowl and other wildlife (p. 73)"

Little loss or alteration of wetlands in eastern Sandhills counties such as Brown, Garfield, Rock and Wheeler is noted in the earlier NGPC survey in the 1960s. Other activities have impacted Sandhills wetlands. These include roads and other public works, although the low population density and infrastructure in the region has reduced the overall impact of such projects.

Southwest Nebraska Transition Area

The southwestern Nebraska counties of the Upper Republican River Basin represent a transitional area between the wetland types of the Sandhills found to the north and those of the Rainwater Basin to the east. Wetlands in this area are generally split between the two areas in wetland inventories. A 1975 USDA resource inventory of the Republican River Basin notes:

> The basin contains a small number of wetlands . . These are located in two areas: one is the sandhills of Chase, Perkins, Keith and Lincoln Counties; the other is the rainwater basin which overlaps into the river basin in parts of Franklin, Gosper, Harlan, Kearney and Phelps Counties. (USDA, 1975, pp. IV- 41-44)

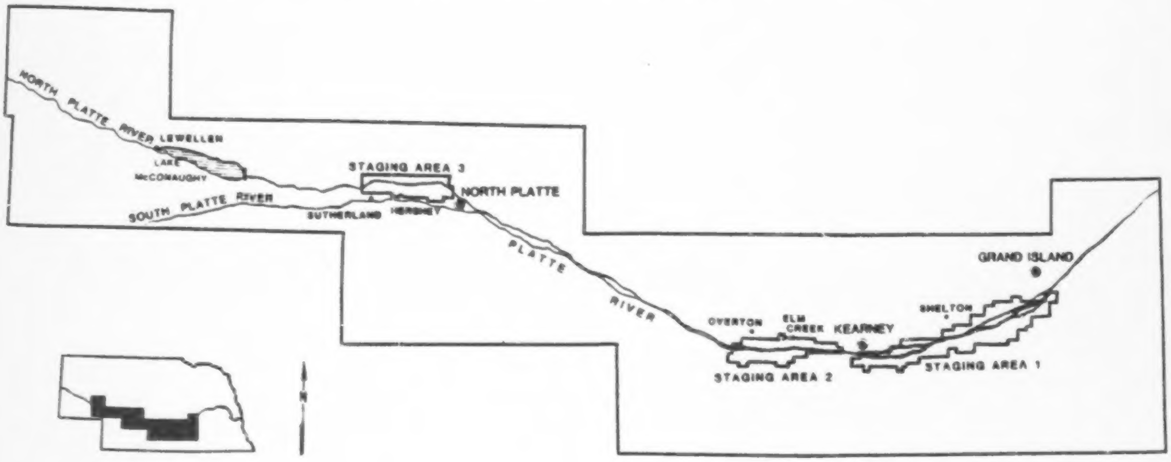
The western Rainwater Basin counties have experienced "groundwater mounding" in some cases from canals and reservoirs in the area. At the same time, groundwater drawdowns in the upper Republican basin have been significant. According to the NGPC inventory, many of the wetland areas in the upper Republican Basin share characteristics with the Rainwater Basin in that they are depressions with hardpan soils (also confirmed in recent communication with Schildman, 1982a). Hence, they are not as affected by groundwater reductions as streamflows and reservoir levels in the area have been. These wetlands are reportedly persisting and are evident in wet years except in fields under center pivot irrigation (Schildman, personal communication, 1982a). Center pivot irrigation development in the area is extensive.

Distribution and Trends Related to Riparian Wetlands

Although a small percentage of the statewide distribution of wetlands (estimated at 3 percent of the total by NGPC, 1972, and a total of 142,472 acres by Rundquist, et.al., 1981), riparian wetlands are highly significant habitat while serving other functions as well. This discussion focuses upon wet meadows and other wetlands in the Platte Valley considered essential staging areas for sandhill cranes and critical habitat for whooping cranes. Platte River wetland areas are also important to millions of migratory waterfowl and other birds.

Wet meadow areas which lie along the Platte River are hydrologically tied to surface flows in the river. They are also sensitive to precipitation levels and surface runoff. Sandhill crane staging areas include reaches on the Platte River from Kearney to Grand Island and from Overton to Elm Creek, and on the North Platte branch, from Sutherland to North Platte (see map below).

SANDHILL CRANE STAGING AREAS IN THE CENTRAL PLATTE VALLEY


NORTH PLATTE RIVER
LEWELLEN
LAKE McCONAUGHY
STAGING AREA 3
NORTH PLATTE
SOUTH PLATTE RIVER
SUTHERLAND
HERSHEY
PLATTE RIVER
GRAND ISLAND
SHELTON
OVERTON
ELM CREEK
KEARNEY
STAGING AREA 2
STAGING AREA 1
N

Source: FWS (1981), p. 17

The area's sandbars, open areas and topography combined with the surrounding cropland historically provided the set of ingredients to make the central Platte area uniquely important for migratory waterfowl using the central continental flyway (FWS, 1981). According to FWS (1981):

> Each spring about 80 percent of the sandhill cranes in North America stop for several weeks in the Platte and North Platte River Valleys of Nebraska while enroute to breeding grounds in Canada, Alaska, and the Soviet Union. This concentration of cranes is unparalleled in North America and these sites represent the principal spring staging areas for the midcontinent population (p. i).

Sandhill crane population estimates in the spring of 1979 and

1980 range from 306,000 to 541,000 with two-thirds in the Kearney to Grand Island reach of the river (FWS, 1981). The cranes feed predominantly on corn left in the fields, but an important share of their diet includes protein and minerals, particularly calcium gained from feeding in native grasslands and alfalfa fields (FWS, 1981). This feeding usually occurs nearby the river hence the importance of riparian wet meadows. According to FWS (1981):

> The Platte River Valley is a major fat deposition site for the midcontinent sandhill crane population. [. .] The amount of fat stored varies directly with the length of time individuals stay at the Platte. Approximately 40% of the fat reserves are utilized during the long migration; most of the remaining reserves sustain the birds during the nesting season. (p. ii)

Whooping cranes have specific requirements for roost sites that include a wide channel with wide areas of upstream and downstream visibility, shallow water (except in the main channel), and other considerations (FWS, 1981). They feed widely in the area on animal and plant sources and have been observed in Rainwater Basin wetlands to the south (FWS, 1981).

Mallards and other ducks utilize the Platte River, some wintering there. They often move to the Rainwater Basin area when it becomes free of ice and will move into the Sandhills as the ice-free area moves north. White-fronted geese also use the Platte and Rainwater Basin wetlands in a similar fashion. The FWS (1981) says: "Most of the midcontinent population of white-fronted geese spend several weeks" [in the area preparing] "physiologically for migration and reproduction" (p. iii). Overall, 5 to 7 million ducks and geese utilize the central Platte area annually including the Rainwater Basin during migration (FWS consultation, 1982, Grand Island).

Platte River habitat also is important to least terns (a threatened species in Nebraska) that use sandbars for nesting; bald eagles who depend on river flows for fish; and numerous breeding birds which utilize native grasslands (FWS, 1981).

The total acreage of wet meadows in the central Platte area has not been determined. However, it has been generally estimated that roughly 60 to 70 percent of the wet meadow acreage has been degraded as wildlife habitat through conversion to cropland (corn and alfalfa production)(FWS consultation, 1982, Grand Island).

River flows have been reduced historically particularly peak flows which scour sandbars thus maintaining crane habitat. According to FWS (1981):

> With approximately 70 percent of the Platte's annual flows diverted for various consumptive uses upstream in Colorado, Wyoming, and western Nebraska, channel width in many areas has been reduced to 10-20 percent of former size. Habitat conditions within the existing channel have also changed as a result of reduced scouring of sandbars and shifting of alluvial sediments. A broad band of mature deciduous woodland now occupies tens of thousands of acres that formerly were part of the river and numerous islands overgrown with woody vegetation exist within the channel. Concurrent with diminishing surface flows . . the water table beneath adjacent native grasslands has declined, thereby facilitating extensive conversion of these sites to cropland. (p. i)

FWS (1981) also notes:

> Analysis of annual tree rings and other data indicate wood vegetation encroachment on the channel occurred principally after Kingsley Dam on the North Platte River and the Tri-County Diversion Canal on the Platte River became operation during the early 1940s. (p. iv)

Activities Responsible for Changes in Platte River Riparian Wetlands

Several associated activities are and have influenced the condition of wet meadows along the Platte River. These include upstream impoundment and diversion and irrigation development in and along the river valley. Both affect the valley's groundwater levels and, thus, the condition of wet meadows along the river which are linked to it.

1. Impoundments and diversions: There have been numerous impoundments of the flow of the Platte River upstream and numerous diversions of flow for irrigation and power in a managed system (Nebraska Dept. of Water Resources, 1981). A number of additional projects are proposed. Past projects have reduced peak and average annual flows and thus reduced recharge of groundwater levels in the wet meadow areas along the Platte.

2. Conversion of meadows to cropland: Wet meadow areas along the Platte have historically been used for a variety of purposes including corn and alfalfa production. However, conversion of grassy meadows to these uses has become increasingly extensive thus jeopardizing their value as habitat. Alteration of

surface drainage patterns and local groundwater drawdown by irrigation in association with this conversion further reduces the viability of wet meadows as habitat.

Overall, the trend of deterioration of Platte River riparian wetlands appears to be one of continued losses. This trend could accelerate with major new diversion projects which would further reduce river flows. This may push the situation well past the critical point in terms of habitat for migratory birds especially in light of similar trends in other areas.

Other Riparian Wetlands

Other wetlands along rivers, streams and impoundments in the state have variable degrees of importance to wildlife however, there are no estimates of their total acreage. It is generally known that channel realignment and stabilization activities have taken a toll on these wetlands, but again, the extent is not known. Present trends point to potentially significant reduction and deterioration of riparian wetlands subject to how stream flows are managed and continued ground and surface water development for irrigation.

Activities Responsible for Changes in Riparian Wetlands

1. Channelization: Historically, channelization has had a great effect on the Nemaha Rivers during the period 1890-1920 (FWS, 1981a). It has also had an impact on other rivers and smaller streams.
2. Surface water appropriation: Upstream withdrawals for irrigation have significantly influenced the decline of riparian wetlands due to reduced streamflow (Thomas, personal communication, 1982).
3. Impoundments and diversions: Major impoundment, storage or diversion of streamflow can have a significant influence on riparian wetlands depending on hydrologic factors and the management of peak and low flows. There may well be thresholds of low flows below which wetlands are not effective habitat or are not fed by streamflow.
4. Changes in groundwater levels due to irrigation expansion: Shifts from grassland to irrigated cropland utilizing groundwater can reduce streamflow and thereby reduce the extent of riparian wetlands. Alteration of surface runoff associated with land use changes can also affect riparian wetlands.

Summary and Conclusions

As stated throughout this review, trends associated with the past and present distribution of wetlands in Nebraska illustrate significant, although varied, reductions in the extent and quality of these areas particularly as wildlife habitat. Systematic inventorying with extensive field-checking both complimented by comprehensive, in-depth studies are needed to accurately determine and monitor both the extent of wetlands and their processes. This is particularly important if the dynamics of wetlands are to be understood over short and long time spans.

A clear understanding of wetland hydrology on a regional basis carefully related to important functions of wetlands is sorely lacking.

Within the limits of available information, Table 6 summarizes wetland conditions and trends in Nebraska.

TABLE 6: SUMMARY OF WETLAND DISTRIBUTION, TRENDS AND INFLUENCES IN NEBRASKA

Area	Estimate of Supply of Wetlands and Remaining Share	Assessment of Current Trend	Future Physical Influences
RAINWATER BASIN	- 14,000 to 24,000 acres - 15 to 25% of original acres - 10 to 15% of original basins	continuing loss limited by remaining acreage and what is already under public management and protection	continuing drainage or partial drainage and leveling for conversion to cropland; accessibility subject to precipitation and alteration of surface drainage
SANDHILLS	- over 1 million acres - 85 to 95% of original acres - over 95% of original basins	accelerating loss in last decade particularly in the eastern Sandhills region	long term reduction in groundwater levels and seasonal groundwater variations due to expanding center pivot irrigation, some associated leveling and filling
CENTRAL PLATTE VALLEY	- acreage not estimated - 30 to 45% of wet meadows remaining of original distribution - extent and quality of sandbars significantly reduced - extensive woodland encroachment	continuing loss or deterioration	pursuit of further upstream impoundment; management of remaining peak and minimum flows. continuing wet meadow conversion to cropland; continuing irrigation development and groundwater decline
OTHER RIPARIAN WETLANDS	- acreage not estimated - remaining share uncertain and considerable regional variation	continuing loss or deterioration subject to regional variation	increases in surface water appropriation; impoundments and diversions; maintenance of streamflows; grassy meadows conversion to cropland and associated groundwater development; channelization activity

Note: These estimates represent an attempt to assess conditions and synthesize information from a variety of sources consulted during the study. Most reflect a view toward the viability of wetland areas as wildlife habitat.

Significant Impacts Associated with Wetland Development Trends

The critical functions of Nebraska wetlands with respect to the general diversity of species (biological productivity) and essential importance to particular species (migratory birds) are most frequently recognized. These functions are actually what make the loss of wetlands most significant in Nebraska. However, wetlands also function in flood retardation (collection points), in retention of sediment and nutrients, and as aesthetic, visual and recreational resources. They also serve as indicators of the general condition of the resource base (e.g., the level of groundwater in the Sandhills for example).

But, again, emphasis is placed on the importance of wetlands to migratory birds and as year-round habitat for other wildlife. As such, this role receives the greatest attention throughout this study.

The impact of wetland loss in Nebraska is generally reflected in the concentration of wildlife in fewer and smaller areas and the reduction of important components of their food supply and breeding, roosting and staging areas. One result of this is a general increase in the risk of disease among migratory birds.

Rainwater Basin

1. Change in Wildlife Habitat

a. increased incidence of disease and potential increased risk of disease

Three diseases affecting ducks and geese are associated with reduction in number and quality of wetland areas. Botulism in waterfowl may be associated with changes in wetland quality resulting from changes in water levels and agricultural practices (FWS, 1981). Concentration of migratory birds in fewer wetlands increases the risk of more widespread outbreaks in duck and geese populations. The effect on sandhills cranes and whooping cranes has not been determined (FWS, 1981).

Duck plague has been reported in adjacent states and it is assumed that increased waterfowl densities increase the risk of this disease. Reduced flows in the Platte River enhance this risk (FWS, 1981).

Avian cholera (fowl cholera) is not proven to be associated directly with densities of birds, but it is assumed that concentration of migratory birds in fewer wetland areas can assist in the spreading of this disease (FWS, 1981). Devastating cholera outbreaks have occurred in the Rainwater Basin in recent years. In 1975, 20,000 to 25,000 birds were lost with around 8,000 lost in 1976, 75,000 to 100,000 in 1977 and 72,000 to 80,000 in 1980 (NGPC, 1981a).

Cranes and other species may be susceptible to avian cholera (FWS, 1981). At present numbers, this threat to whooping cranes increases the risk against survival of an endangered species. Reduction in the number and size of Rainwater Basin wetlands appears to be strongly associated with increased likelihood of greater mortality from these diseases for all waterfowl, particularly when considered in combination with reductions in nearby Platte River habitat and wetlands.

b. reduction in food supply for migratory birds

Rainwater Basin wetlands serve as a staging and conditioning area for certain species moving from the Platte River when the area becomes ice free (FWS, 1981). Significant weight gains are noted for white-fronted geese using the area and other species (FWS, 1981). Harmon (1981, 1982 personal communication) stresses the potential loss of food which is ordinarily made available through the cycles of drying and flooding in wetlands. This relatively small share of the duck population's diet may play a large role in their eventual reproduction.

c. loss of breeding and rearing habitat

Larger wetlands serve as breeding areas and rearing areas for shorebirds and upland species as well as ducks and geese. Alteration of wetlands may affect the entire wetland area (Weller, 1981) and thus partial drainage and filling can have a significant effect.

d. furbearers

Although not as significant as in the Sandhills, furbearer habitat is reduced with loss of wetlands in the Rainwater Basin (primarily muskrat, mink and beaver).

2. Change in Surface Drainage

a. reduced retention of surface runoff

Although reduced in number, Rainwater Basin wetlands serve some function in the retention of surface runoff and thus the reduction in peak flows during floods (Harmon, personal communication, 1982). The magnitude of this impact overtime is uncertain.

3. Change in Recreational, Visual and Aesthetic Resources

While not measurable, except in terms of acreage reduction, these impacts may be among the most overlooked. Diversity in the rural environment, observation and scientific study and recreational opportunities are foregone as wetland areas are reduced and lost. For many Nebraskans, the wetlands of their regions are important identifiers of their home areas and their natural heritage.

Sandhills

1. Change in Wildlife Habitat

a. change in breeding and rearing areas for ducks, geese, migratory shorebirds and breeding birds

The Sandhills are an extensive breeding and rearing area for a large number of species of ducks, geese, shore birds and wading birds. It is a waterfowl breeding area of national significance (NRC, 1981). Reductions in the number and size of wetlands would limit this function. Seasonal as well as long term trends would have this effect.

b. change in habitat for terrestrial species

Furbearers and numerous other species utilize areas within Sandhills wetlands for wintering areas, food and water supply and cover. These include deer, ring-necked pheasants and others. Reduction in groundwater levels leading to drying up of wet meadows or reduction in size of larger wetlands will have a significant impact as will direct drainage or leveling (filling) of wetlands.

c. change in habitat for aquatic species

Fish and other aquatic life are significantly affected by reductions in wetland depth and/or size and associated change in quality. Larger Sandhills wetlands which are not alkaline often have significant fish populations (NRC, 1981).

2. Agricultural Use

a. loss of hay production from wet meadows

Hay from subirrigated meadows or areas around larger wetlands is an important source of feed for livestock. This resource is diminished when meadows are drained, filled or dewatered from declines in the groundwater table.

b. land use shifts

At the same time, there are some gains in cropland or hay production acreage from the draining of wetlands. These changes often have secondary negative impacts on soils, water quality and wildlife (NRC, 1981).

3. Other Changes

Wetlands, including wet meadows, are an important indicator of the presence of groundwater which is often exposed in Sandhills wetlands (except for the "closed basins" to the west). Although groundwater supplies are vast and can be obtained with deeper wells, exposed groundwater is a resource for livestock and human use, an indicator of the functioning of a unique grassland environment and a significant recreational and visual resource.

Platte River

1. Change in Wildlife Habitat

a. reduction in staging area for sandhill cranes

The staging areas for sandhill cranes have contracted in size and are continuing to do so. This is both in terms of reduced size of the river channel and associated encroachment of woody vegetation and reduction in the suitability of sandbars for roosting habitat as well as the loss of wet meadows as a source of food supply significant to the sandhill crane's diet (FWS, 1981). Reduction and stabilization of river flows, conversion of wet meadows to cropland and encroachment of woody vegetation as well as irrigation development all affect the quality of wet meadows along the Platte (Currier, personal communication, 1982, Grand Island). Both areas are significant for the migration of this species.

b. reduction in habitat for whooping cranes

The requirements for roosting habitat on sandbars for whooping cranes are demanding in terms of both area and quality in the Platte River. This habitat has been reduced and degraded due to the diminished average and peak flows of the river.

c. increased disease risk for migratory birds

Reduced Platte flows and possible shifts of sandhill cranes and whooping cranes to Rainwater Basin wetlands potentially increases their risk to avian cholera (FWS, 1981). In addition, reduced flows in the Platte limit dilution of duck plague (FWS, 1981). Development of "slackwater conditions" in the spring on the river may considerably increase the risk of avian cholera (FWS, 1981).

d. impacts on other bird species

Bald eagles depend on Platte flows for fish. Breeding birds utilize native grassland and wet meadow areas. Their numbers and the general diversity of species may be significantly reduced by reductions in these meadows (FWS, 1981). Of 35 species noted in grassland habitat, 27 were "breeders." Conversion of wet meadows to corn would likely reduce the number of breeding species to three (FWS, 1981).

Other Riparian Wetlands

It is likely that riparian wetlands fulfill all of the classic functions of wetlands (water retention and associated retardation of runoff and floodwaters, trapping of sediments and recycling of nutrients, wildlife maintenance in terms of diversity of species, including fish, furbearers, birds and others, and migratory habitat or wintering areas for ducks, geese and other migratory birds). In addition to wildlife habitat of many types, water quality and quantity changes may be associated with deterioration or loss of wetlands (DEC, 1979).

These conditions vary considerably around the state and a comprehensive inventory of the state's riparian wetlands which catelogs their condition and functions has not been done.

FACTORS BEHIND WETLAND TRENDS

FACTORS ACCOUNTING FOR WETLAND TRENDS IN NEBRASKA

Introduction

Nebraska is a major agricultural state of the U.S. covering over 77,000 square miles of territory with a total population of around one-and-a-half million. Around a half of its population is concentrated in the Omaha and Lincoln metropolitan areas.

All three of the major wetland areas included in the study are outside these metropolitan areas and are, for the most part, subject to influences tied to agriculture and, secondly, to rural road construction, upgrading and improvement.

Physical factors influencing wetland trends in Nebraska both define the hydrology and peculiar dynamics of the various wetland areas of the state and in part determine the full impacts of man's activities on the sustenance of such wetlands. Hence, physical factors such as climate, soils and hydrology affecting wetland trends have largely been enumerated and discussed in the context of reviewing the trends themselves. These are briefly summarized again in this section.

The economic analysis which follows focuses upon decisionmaking factors behind farmers' and other landowners' decisions to drain or otherwise alter wetland areas to improve their use for agricultural production. Public programs which may assist them is doing so and rural road construction also are discussed.

Beliefs and attitudes of farmers in general are briefly discussed because they may play a major role in land use decisionmaking. An attempt is also made to evaluate the notion that draining or modifying wetlands in Nebraska for expanded agricultural use is in fact profitable and, if so, to what extent. Net revenue flows per acre of wetlands so converted are estimated for a number of cases. These are used in assessing the adequacy of benefits farmers can receive for maintaining wetland areas under various existing protection programs.

The economic analysis also generally assesses possible effects on the state and region's economic base of expanded agricultural use of wetland areas.

Considerable attention is given to an analysis of the system of property taxation in Nebraska. It is regularly asserted that the existing system may encourage wetland drainage and that some type of property tax exemption for preserving wetlands in private lands is needed.

Finally, a discussion of legal considerations in the use of wetlands in the state is given.

Physical Factors

Elemental physical factors of climate, hydrology, soils and vegetation determine and condition wetlands in Nebraska. Such physical factors operate in mutual association with, and as variable constraints to, human intervention in the management or alteration of wetlands. Different factors have primary importance for different wetland areas of the state, although precipitation is an obviously critical factor in every area.

Other aspects of the hydrologic cycle are less clear in each significant wetland area. The relationship of the condition of wetlands to groundwater levels, movement and supplies remains an outstanding concern even in the Sandhills where direct association with wetlands and groundwater levels is generally assumed, but also in the Rainwater Basin and in the Platte Valley and other riparian areas. Relating hydrologic characteristics to chemical and biological conditions of wetlands is necessary to fully comprehend the dynamics of wetlands across the state, but particularly in the Rainwater Basin as suggested by Pederson (personal communication, 1982).

The interactions of climate and soils in the Rainwater Basin and the interaction of climate, hydrology, soils and vegetation in the Sandhills both influence the human use of these areas. Accessibility to Rainwater Basin wetlands is generally recognized as constrained or facilitated by the amount of precipitation and the resulting interaction with "hardpan" soils. Groundwater levels in the Sandhills influence the productivity of wet meadows and the size and condition of lakes and marshes. Platte River flows and the condition of wet meadows are likewise influenced by precipitation as well as upstream water management.

Few of these systems have been studied comprehensively, particularly in relation to habitat, human use and hydrology with the possible exception of the central Platte Valley (FWS, 1981) and potential comprehensive and long-term studies of the Sandhills (NRC, 1981)

Additional influences of human use should be noted, although they are not fully documented. These include the effects of expanded use of agricultural chemicals (FWS, 1981) and possible influences of other aspects of agricultural land management of surface runoff.

The following physical factors are significant influences on the condition of wetlands in Nebraska.

1. Climate

There is a significant deficit between annual precipitation and evapotranspiration rates across the state. Precipitation in the Rainwater Basin has historically been in the range of 23-24 inches annually, somewhat above the statewide average. At the same time, parts of the area have both exceeded and been below the statewide average by significant amounts in selected years. Additionally, it is often noted that precipitation patterns can be spatially irregular and take the form of isolated major storms (Neb. Soil and Water Conservation Commission, 1971). The Sandhills region is more apt to be below the state annual average of precipitation with substantial portions with less than 20 inches annual precipitation.

The influence of climate is seen in the Rainwater Basin in seasonal and sometimes longer term cycles of drying and flooding of wetland areas. These influence the biological and chemical quality of wetlands, particularly with respect to vegetation and food supply for wildlife and disease risk (Harmon, 1981 and FWS, 1981). Additionally, precipitation in substantial amounts is necessary for Rainwater Basin wetlands to play a significant role as staging areas for migratory birds in the late winter and spring and as breeding areas later in the year. A carry-over of the previous year's precipitation is often necessary as well as supplementary winter and spring precipitation (Hyland, personal communication, 1982). Access to wetlands for modification is constrained by substantial precipitation in spring and fall. Wet grounds and/or crops at these busy times of the year for farmers cause special problems particularly when wetlands are involved. Wetland fields may be so wet that they cannot be entered. If this situation continues for very long, planting periods may be missed or crops, even if planted, may not be harvested, difficulties particularly obvious this year.

Variation in precipitation in the Sandhills is seasonally influential in the composition of wetland vegetation in terms of the various hydric zones (Gilbert, Freel and Bieber, 1980). The size and quality of wetland areas across the Sandhills are influenced by climate on a seasonal and long-term basis. Alkalinity (in "closed basins") level of groundwater in relation to precipitation and evapotranspiration are aspects of this influence.

Platte River riparian wet meadows depend on precipitation for late winter streamflows necessary for the area's staging area function and for the direct effect of surface runoff and groundwater recharge (Hyland, personal communication, 1982). Upstream precipitation is important as well, but precipitation in the Platte Valley itself is seen as particularly significant to the condition of the river channel and adjacent wetlands.

2. Soils

Soil type is an obvious influence on the character of wetlands in the Rainwater Basin with respect to the interaction of precipitation cycles and basin soils which hold water and in the Sandhills in terms of the relationships between precipitation, sandy soils, vegetation and groundwater. Erosion appears to be a modest influence in the Rainwater Basin as reflected in accounts of small basins filling with windblown soil in the 1930s (NGPC, 1972) and the filling of some small basins with sediment transported by surface runoff, a process which is often accelerated by farming practices (Schildman, personal communication, 1982).

3. Hydrology

Groundwater level and permeability of water-bearing materials are significant influences on water levels in Sandhills lakes, although detailed studies to establish these relationships with some precision are still underway (Pederson, personal communication, 1982). While it is generally assumed that changes in groundwater levels obviously have significant seasonal and long-term effects on Sandhills lakes and wetlands, these influences are under further study (Harrell, personal communication, 1982). Wetland vegetation distribution will likely be directly affected by declines in groundwater levels in areas with close-lying groundwater tables. Both hay production and aquatic vegetation would be affected.

Alterations in surface runoff are significant factors in the hydrology of Rainwater Basin wetlands. It is likely that there is some seepage from these wetlands, since there is little evidence of salinity in these areas (Pederson, personal communication, 1982). Inflow from groundwater is unlikely except in areas of "groundwater mounding" from unlined canals and reservoirs in the western part of the Rainwater Basin since overall the depth to water is generally greater than 50 feet. Groundwater drawdowns are significant in many parts of the Rainwater Basin but this trend and the decline of wetlands have not been interrelated.

Platte River wet meadows are dependent on maintenance of streamflows and associated groundwater levels.

4. Chemicals

Regarding the runoff of agricultural chemicals as a possible influence on the biological functions of wetlands, it is noted:

> Influxes of agricultural nutrients...may disrupt the nutrient budget of wetlands...stimulating the growth of certain invertebrate populations, or algal blooms which lead to oxygen depletion followed by aquatic invertebrate or vertebrate mortality. The introduction of insecticides may cause direct mortality of invertebrates, whereas the application of herbicides can disrupt aquatic food chains by the sudden depression of phyloplankton production. (FWS, 1981, p. 84)

These changes may be associated with botulism in migratory birds (FWS, 1981). They are associated with changes in water level and other factors as well.

ECONOMIC ANALYSIS OF NEBRASKA WETLAND TRENDS

The economic analysis concentrates on agricultural pressures on the state's wetlands, attitudes and decisionmaking of farmers, various government programs and activities influencing wetlands, and the impact on the regional economy of the Rainwater Basin area of wetland loss and conversion to more intensive agricultural use. An attempt is made at generally estimating the profitability to farmers and other landowners of converting wetlands to more intensive agricultural use. Several case analyses are constructed for this purpose which integrate different sets of assumptions and conditions based upon the specific wetland region involved.

Rural Road Construction and Maintenance in Nebraska

The impact of the county road system on wetlands cannot be overemphasized; nor can it be fully appreciated unless a visit is made to an area such as the Rainwater Basin after a heavy rain. The county road system serves three functions with regard to wetland deterioration. The interconnected ditch system serves to drain an area rapidly. Second, in very flat areas, the ditches help drain the wetlands through water storage. Third, roads built across wetlands sometimes serve as dikes or dams.

The road system in Nebraska has been guided by studies and policies made in the late 1960s (Nebraska Department of Roads Publications, 1966 and 1967). At that time the goals and functional design of Nebraska roads and highways were made for future decades with little sensitivity to concerns such as soil erosion, wetlands deterioration and energy shortages. At the state level, the main concerns in the design of roadside ditches have been safety and drainage to protect the road subgrade from becoming permeated with water.

These functional design criteria have been used in determining qualification for federal matching funds for building county roads. Under the federal program, counties receive 75 percent of the cost of road construction from the federal government. Currently that cost is $25,000 to $30,000 per mile for existing road beds when they are gravel-topped (Standard Type 4). Asphalt-topped, farm-to-market roads are much more expensive and vary greatly in cost.

Funding sources and levels for county road construction and maintenance activities have varied considerably over the years. Currently, besides moneys received from the federal government (which have been declining in recent years), counties' primary source of road funds is the state through its Highway Allocation Fund (supplied by state gasoline tax revenues). Both state and federal assistance require cost-sharing by the county. The state requires 25¢ by the county for every 75¢ of state assistance. Counties collect their share from property tax receipts, inheritance tax receipts, and a variety of other sources.

Spending by individual counties around the state varies considerably and is reported in various forms by counties. Counties file one and six year reports each year with the State Roads Department giving estimates for coming year expenditures. Estimates of planned expenditures for rural road construction for a nine-county area composing most of the Rainwater Basin (Adams, Clay, Fillmore, Gosper, Hamilton, Kearney, Phelps, Polk and York Counties) are around $2.6 million in 1980, $1.1 million in 1981 and $2.0 million for 1982. These estimates contain estimated road construction expenditures on all arterial, collector and local roads under the jurisdiction of counties (which excludes state highway system roads and roads within incorporated areas). About 68 miles of rural roads are included in the 1980 estimates with about 48 miles in the 1982 estimates.

Rural road resurfacing, hard-surfacing of gravel roads, road widening, bridge work and similar construction activities are included in these estimates. However, ditch cleaning (including some deepening and widening) work is usually not included in these estimates but as "maintenance" and in recent years most counties have been spending more on road maintenance than road construction.

A standard flat-bottomed "8 ft." or "4 to 1" ditch design has replaced the old "V"-shaped ditch. Most of the county road equipment now fits the "8 ft." ditch. The larger ditch allows vehicles going off the road to come out on the other side of the ditch without impacting or rolling. It also allows an optimum between moving large volumes of water rapidly without extremely high velocity and accompanying erosion of the roadbed and ditch while allowing for enough velocity to scour ditches of silt washed from adjacent fields.

Since one goal is to drain an area rapidly after a rain, road ditches also often assist in draining wetlands. In draining water rapidly, soil erosion on tillable land occurs creating the main problem encountered in rural road drainage systems; silting in and plugging of underroad water passages.

Nebraska Department of Roads staff indicate that one of the main design concerns of federal road inspectors is that water be moved out of ditches in order to protect road and highway subgrades. Road-building contracts encourage contractors to coordinate their building with adjoining landowners who often seek to use ditches for drainage. Considerable responsibility for road construction and maintenance is at the county level and farmers often exert pressure on local officials to improve drainage as roads are upgraded. As the 1960s NGPC survey noted, "Deep county road ditches located around most sections have reduced the volume of water, by intercepting part of the watershed drainage. . . County authorities have contributed significantly to the volume of drainage by providing deep road ditches that are readily accessible through ditching to the nearest road" (NGPC, 1972, p. 19).

In some areas of the Rainwater Basin, the terrain is too flat and the basins too isolated for effective drainage. In many of these areas, large road ditches partially drain wetlands by storing water (there are cases where ditches reach six to eight feet deep). Nebraska Department of Roads personnel estimate that standard road ditches can hold approximately 170,000 cubic feet of water per road mile (both sides) which translates into about 4 acre-feet. This is equivalent to about eight acres of a Type III wetland averaging six inches of water in depth.

According to several Roads Department personnel contacted, ditches in areas of flat terrain are actually dug deeper than standard design. In dry years, road builders also may dig down an extra 1½ to 2 feet at almost no extra cost in order to further offset silting and subgrade damage in wet years. In addition, adjoining farmers dealing directly with contractors often encourage them to increase ditch sizes for drainage purpose (Nebraska Department of Roads staff interviews, July 1982).

Roads may also serve as dikes in some cases, often making reuse dugouts or reuse pits more effective. In a field visit of many Rainwater Basin wetlands (July, 1982), numerous cases of this were observed. Roads Department staff indicated that if the original road (some built as early as 1870) through a wetland is without a culvert, pipe, bridge, or other form of water conduit, and the road serves to keep part of a basin's water from reaching a farmer, that farmer may threaten legal action if at a later date a waterway is proposed. Once a wetland is isolated from much of its original drainage area, a dugout or long, deep storage ditch is very effective in draining it especially when newer, taller roads with bigger and deeper ditches are later built. In one case, a reuse pit nearly a half mile long and approximately 40 yards across, built adjacent to a road, was observed in a Rainwater Basin wetland.

The Nebraska Department of Roads has no written policy, manual, or guidelines of its own to minimize adverse impacts on wetlands nor a written statement in response to the Department of Transportation (DOT) policies articulated in Executive Order 11990. Instead they use DOT Order 5660.1A (August 24, 1978) as a guide for new road beds or alignments. However, there are few new alignments and DOT 5660.1A "does not include routine repairs and maintenance of existing facilities" (p. 3) while it is much of this maintenance and improvement of existing roads which continues to impact wetlands.

With new roads and highways and major construction, the Nebraska Department of Roads uses an "early coordination process" in which other affected or interested agencies (Corps of Engineers, U.S. Fish and Wildlife Service, Nebraska Game and Parks Commission, etc.) are contacted during early stages of design. If a recognized wetland area may be involved, these agencies advise the Department on ways to minimize project impacts on the wetland. As stated in a study of the Nebraska Department on Environmental Control (1982):

> The Project Development Division within DOR conducts a technical evaluation of all possible road projects (involving federal funding) before they advance to the final stage preceding construction. Part of this technical evaluation involves 'environmental clearance' in which possible projects are evaluated in terms of NEPA requirements (p. 27).

Public Agricultural Conservation Programs

Perhaps equally or more significant than road building in destroying wetlands in Nebraska has been government programs to subsidize land leveling for irrigation, installation of dugouts and reuse pits, and drainage by farmers. As noted previously, many of the Rainwater Basin wetland basins that have been lost are smaller than average in size. It is most feasible for individual farmers with the aid of government subsidies to impact effectively on these smaller wetlands. In the Rainwater Basin,

> a majority of the wetland destruction occurs as a result of attempts to gain agricultural land . . Great sums of money have been expended by land owners and tenants to ditch, dike, level, purchase right-of-way, and pay costs of court actions resulting from drainage efforts. Substantial amounts of money and federal funds have also been expended in activities designed to bring more land into agricultural production. Most of the efforts appear to have been economically unsound (and) the land has flooded or remained too wet to farm. (NGPC, 1972, p. 19)

In analyzing this further, a virtually endless chain of government subsidies can be seen. As Congressman Reuss stated many years ago:

> the federal government has been paying out millions of taxpayers' dollars to encourage farmers to drain wetlands . . Such drainage brings into existence new surplus crops of corn, wheat, and other grains. Additional millions of tax dollars are then spent for government purchases of surplus corn and wheat, and for the soilbank program to take corn and wheat land out of production. Further illustrating the inconsistencies, conservation reserve payments are now being made in some instances to restore marshlands previously drained with [government] assistance. (NGPC, Rainwater Basin, 1982, pp. 6-7)

The many types of potential subsidies involved make an appraisal of the economics of wetland loss in Nebraska most difficult.

The 1975 Groundwater Management Act adopted by the Nebraska Legislature also inadvertantly affects wetlands.

> A section of the Act requires that all irrigation runoff be retained on the landowner's property. Even though this law did not deal directly with wetlands, it has had a significant detrimental effect in the Rainbasin marshes. Though nothing new to south-central Nebraska, the dugout, or reuse pit, became even more common as a means of collecting irrigation runoff. The reuse pits were not only effective in

> collecting irrigation runoff, but natural runoff as well, and in concentrating water that was formerly spread over a larger area (often a temporary wetland valuable to migrating waterfowl in the spring) and in some cases permanent wetlands, into a very small area . . . To further compound their effect, dugouts on private land adjacent to state or federal wildlife areas were frequently effective in draining water from public land. (NGPC, Rainwater Basin, 1982, p. 7)

A University of Nebraska agricultural engineer indicated that irrigators could do without large pits often suggested by SCS if they are to be used strictly for irrigation runoff. Large pits with large pumps are, according to him, intended to also drain rainwater. (Paul Fischbach, personal communication, July 1982).

Personnel at the state SCS office emphasize that a reuse pit could not adequately serve its function if not placed at the lowest point in the field (staff interview). Observations made in the Rainwater Basin confirmed this belief. Nearly every irrigated farm observed in Fillmore and Clay County which contained a reuse pit in a wetland area had the pit located to drain the wetland (study field visit, July, 1982).

Although increasingly constrained for use involving bona fide wetlands, several avenues are available to landowners in the state for receiving public cost-share assistance in constructing irrigation tailwater pits or leveling irrigation land. One program is administered by USDA's Agricultural Stabilization and Conservation Service (ASCS), another by the Soil Conservation Service (SCS), and the last by the State Natural Resources Commission.

The largest of the three is the Agricultural Conservation Program (ACP) of ASCS. Under the program, farmers may receive payments up to 80 percent of the cost of construction of a variety of conservation practices. Technical assistance may also be provided under the program by SCS. Practices for which cost-sharing is offered are developed by farmer-elected committees at the county level in consultation with county program development groups subject to the approval of a state ASC committee.

As noted in a recent ACP annual report, "[t]he incentive provided by the federal cost-share stimulates private investments and brings practice accomplishments that would not otherwise result" ("1978 Agricultural Conservation Program Accomplishments," prepared by Nebraska State ASCS, p. 1).

One of the practice categories for which assistance is available is referred to as "irrigation water conservation." Construction of tailwater recovery systems, land leveling, and installation of irrigation ditch lining and underground piping are all included in this practice. Up to 60 percent of the average cost of undertaking such practices has been offered in recent years up to a payment limit per person of $3,500 (before fiscal 1979, the limit was $2,500).

Regarding the applicability of cost-share assistance under this practice, the State ACP Program Handbook (1982) says it applies to . .

> . . reorganizing systems on land currently under irrigation for which an adequate supply of suitable water is available, on which irrigation will be continued, and on which a significant soil or water conservation problem exists. (p. 48, underlining added)

The ACP Handbook specifically states that cost-sharing is not authorized for "modifying a system if the primary purpose is to bring additional land under irrigation" (p. 48). Land considered "currently irrigated" is land that has been irrigated four of the last five years.

Regarding dugouts or reuse pits specifically, the Handbook says, "[r]ainfall runoff will not be considered in the sizing of a tailwater recovery system" (p. 49). Furthermore . .

> A tailwater recovery system may not be located on continuously flowing streams or in areas where they will change the surface area or deepen a natural pothole. (This includes Wetlands Type III, IV, or V . .) (p. 49)

Before payment can be received, facilities for actually reusing the captured water must be in place. The guidelines also say that assistance is not available for installing systems where the "bottom of the pit is below the known groundwater surface" (p. 49). Also, no assistance is available where pits are meant to control runoff from sprinkler irrigation systems (such as a center pivot system).

Cost-sharing for land leveling solely may be extended if "it is a needed part of the plan for the reorganization of the system" (p. 50).

Before providing assistance, the ACP Handbook says, "[c]onsideration must be given to the needs of wildlife, preserving or enhancing the appearance of the area, and potential pollution hazards . ." (p. 50).

With a Reuss amendment to a federal appropriation bill in 1962, ASCS was formally prohibited from offering federal cost-sharing if a project led to the drainage of types III, IV or V wetlands, This prohibition was conditionally extended to types I and II wetlands in August, 1974. Assistance can be extended in draining types I and II wetlands only if they have been cultivated and farmed at least 3 out of the last 5 years.

Determining if a "wetland" area is involved when a request for assistance is received is undertaken by a local SCS agent or technician. A worksheet has been developed by SCS for use in making this determination. It is based upon criteria contained in Circular 39 (U.S. Department of Interior). Soil type, average yearly surface water depth, water permanence and vegetation are all considered.

In addition, existing use of the land is heavily considered and applicants are specifically asked if any wetlands within a project area have been cultivated and used for agricultural production. Again, if cultivated 3 of the last 5 years, assistance can be offered.

A table showing recent ACP cost-share assistance for three areas of the state is shown on the following page. Federal cost-sharing only for "irrigation water conservation" practices including reuse pits and land leveling for irrigation are included. The first group of 16 counties are in the Rainwater Basin with several extending north to the Platte River Valley (Butler, Gosper, Hall, Hamilton, Kearney and Phelps). The area largely encompasses the heaviest irrigated portion of the state. In each of the last five years 18,000 to 33,000 acres in the region were "served" with cost-share assistance for these irrigation practices. Roughly two to three hundred and more farmers and landowners received assistance annually. Actual dollars spent in providing this assistance over the five-year period from 1977 to 1981 range from around $245,000 in 1978 to over $450,000 in 1977 with an average for the period of around $337,000 annually.

The second group of 4 counties are in the extreme southwest portion of the Sandhills while the third group are in the extreme northeast portion. Both areas have been and are being developed for irrigation primarily under center pivot systems. The four southwestern

ACP PROGRAM ACTIVITY FOR "IRRIGATION WATER CONSERVATION" PRACTICES[a] FOR THREE AREAS, 1977 - 1981

Counties	Participants			Acres Served					Total Dollars					Cost-shares Average Per Acre Served					Cost-shares Average Per Participant		
	1979	1980	1981	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981	1979	1980	1981
Adams*	34	24	20	3,764	1,690	3,585	2,126	1,935	28,268	21,548	39,694	27,701	27,156	7.51	12.75	11.07	13.03	14.03	1167	1154	1358
Butler	23	1	5	620	2,471	2,128	60	380	7,744	13,096	10,216	802	6,237	12.49	5.30	4.80	13.37	16.41	444	802	1247
Clay*	20	18	12	3,710	1,150	1,733	1,326	1,092	35,022	9,476	16,312	17,606	13,221	9.44	8.24	9.41	13.28	12.11	816	978	1102
Fillmore	9	3	14	499	101	220	118	309	29,935	5,472	9,852	3,347	20,888	59.99	54.18	44.78	28.36	67.60	1095	1116	1492
Franklin*	12	11	9	751	701	437	607	378	29,552	26,953	14,739	14,123	13,933	39.35	38.45	33.73	23.27	36.86	1228	1284	1548
Gosper*	6	1	1	1,848	390	443	152	68	12,492	7,644	7,089	1,484	1,791	6.76	19.60	16.00	9.76	26.34	1182	1484	1791
Hall*	73	100	94	6,165	3,781	5,971	10,660	7,789	45,374	28,925	63,325	111,396	113,759	7.36	7.65	10.61	10.45	14.61	867	1114	1210
Hamilton*	27	12	11	3,782	1,985	2,641	919	660	56,579	34,281	58,639	33,001	30,659	14.96	17.27	22.10	35.91	46.45	2172	2750	2787
Harlan*	8	4	3	1,829	725	785	498	379	20,521	5,220	6,316	4,321	4,226	11.22	7.20	8.05	8.68	11.15	790	1080	1409
Kearney*	35	18	31	1,341	1,035	1,295	780	1,230	47,337	35,511	52,670	31,466	54,655	35.30	34.31	40.67	40.34	44.43	1505	1748	1763
Nuckolls*	1	--	2	679	95	70	--	45	9,092	1,916	1,078	--	2,116	13.39	20.17	15.40	--	47.02	1078	--	1058
Phelps*	24	19	19	766	1,746	2,543	1,800	2,558	37,274	18,752	9,297	27,098	36,148	48.66	10.74	3.66	15.05	14.13	387	1426	1903
Polk	10	2	5	2,283	717	811	60	290	19,771	11,386	13,003	2,676	5,684	8.66	15.88	16.03	44.60	19.60	1300	1338	1137
Saline	5	3	9	1,078	180	145	130	450	14,089	2,691	2,640	3,393	8,058	13.07	14.95	18.21	26.10	17.91	528	1131	895
Thayer*	12	4	--	774	292	537	210	--	21,749	9,800	15,931	4,963	--	28.10	33.56	29.67	23.63	--	1328	1241	--
York	13	4	11	3,415	893	872	165	863	39,136	12,823	16,862	7,793	17,983	11.46	14.36	19.34	47.23	20.84	1297	1948	1635
Totals	312	224	246	33,286	17,952	24,216	19,611	18,426	453,935	245,494	337,663	291,170	356,514	13.64	13.68	13.94	14.85	19.35	1082	1300	1449
Chase*	15	6	1	1,475	875	1,763	762	160	32,406	12,705	32,398	13,911	1,816	21.97	14.52	18.38	18.26	11.35	2160	2319	1816
Keith*	17	4	1	2,016	1,883	2,405	940	280	25,744	19,772	25,554	9,145	1,710	12.77	10.50	10.63	9.73	6.11	1503	2286	1710
Lincoln*	11	7	7	893	446	440	366	560	19,691	10,481	20,657	11,915	15,966	22.05	23.50	46.95	32.55	28.51	1878	1702	2281
Perkins*	84	1	1	843	6,060	11,565	200	121	15,899	13,817	25,430	2,500	2,715	18.86	2.28	2.20	12.50	22.44	303	2500	2715
Totals	127	18	10	5,227	9,264	16,173	2,268	1,121	93,740	56,775	104,039	37,471	22,207	17.93	6.13	6.43	16.52	19.81	819	2082	2221
Brown*	—	2	2	509	566	--	115	276	9,737	5,303	--	3,763	5,822	19.13	9.37	--	32.72	21.09	--	1882	2911
Garfield*	—	-	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Holt*	—	-	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rock*	—	-	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheeler*	1	-	-	--	180	130	--	--	--	2,837	337	--	--	--	15.76	2.59	--	--	337	--	--
Totals	1	2	2	509	746	130	115	276	9,737	8,140	337	3,763	5,822	19.13	10.91	2.59	32.72	21.09	337	1882	2911

[a] includes re-use pits or tailwater recovery systems, land leveling, underground piping and concrete ditch lining

[*] counties also elgible for assistance under SCS's Great Plains Program

Source: ACP Annual Reports, Nebraska State ASCS Office counties have received from $22,000 to $104,000 each year or an average of around $63,000 annually. ACP cost-sharing in the five northeastern counties has been minimal.

In recent years, ASCS has expended $4 to $5 million annually on a statewide basis through ACP. Under the Great Plains Program, SCS distributes roughly $1 to $1.5 million annually in the state. As under ACP, a variety of practices receive assistance including "reorganizing irrigation systems" (GP-15, which ordinarily involves burying pipeline on existing irrigated ground to convey collected run-off for reuse), irrigation land leveling (GP-16), constructing or enlarging pits or ponds for irrigation water (GP-17) and constructing tailwater recovery systems (GP-26). Cost-shares up to 60 percent of average costs are offered on the first two practices and up to 75 percent on the last two.

While most assistance provided through ACP is on a year-to-year basis, applicants for assistance under the Great Plains Program must enter into 3 to 10 year contracts which set forth a package of conservation practices that are to be undertaken with the help of federal cost-sharing over the life of the contract. Payment limitations under the Great Plains Program are considerably higher than under ACP. Over the course of a single long-term contract, cost-share assistance up to $35,000 may be extended (before fiscal 1980, the contract limit was $25,000). For the individual irrigation practices previously mentioned, cost-sharing is limited to $10,000 ($7,500 before fiscal 1980).

In the list of 25 counties in the table showing ACP assistance, 20 are eligible for Great Plains assistance. A total of around $145,000 was received for undertaking these practices in 1977 in all 20 counties. Most went to counties in the first group (Rainwater Basin area received $134,000 for these practices). In 1979, Great Plains assistance in all 20 counties totalled $78,000 and in 1981, $37,000 for these practices.

State cost-sharing for similar types of conservation practices commenced in fiscal year 78-79 under the Water Conservation Fund. Cost-sharing of up to 75 percent of average costs is available. Although usually used by itself, moneys from the Fund have occasionally been used to supplement ACP payments. This has occurred when ACP payment limits have reduced public assistance below a 60 percent share of costs. Thus, state funds have occasionally made up all or part of the difference.

In all, Water Conservation Fund assistance has helped finance the construction of 203 reuse pits through fiscal 1982 statewide. This amounted to a total of $307,174 in state moneys or an average of around $1,500 per reuse pit (NRC, 1982)..

Wetland Protection Under Public Cost-share Programs

While assistance under both ACP and the Great Plains Program (as well as State Water Conservation Fund which generally uses SCS criteria) is not to be extended where practices involve the drainage of wetlands (types III, IV and V and types I and II if not already farmed), administering agencies and their local agents appear to have considerable discretion in interpreting and applying these constraints. Agency personnel generally admit this and attach much of this discretion to the inherent difficulties of actually formally designating an area a "wetland."

At the same time, even if initially considered a wetland, if an attempt has been made to cultivate and farm the area over the years, it may nevertheless qualify for assistance leading to nearly permanent drainage. Many viable wetland areas in the state have been or are being occasionally farmed.

Because of the year-to-year variability in the condition of wetlands (particularly in the Rainwater Basin where wetlands are more dependent on seasonal and annual precipitation amounts) and in their accessibility for agricultural use, many are continually vulnerable to practices financed through these programs even under existing policy and program guidelines.

Federal agencies provided cost-share assistance as well as technical assistance to drain wetlands in the 1960s and before as a matter of public policy. Today, with gradual changes in stated policy and perhaps even more gradual implementation of these changes, drainage of wetlands for agricultural purposes with federal cost-share assistance is increasingly less frequent. When it does occur, it largely results from flaws in fully implementing public policy at the local level where wetland determinations must be made and assistance denied by local program officials.

Available evidence and consultation with many persons contacted in the course of doing this study suggests that some cost-sharing is still assisting wetland drainage activities. At the same time, federal agency personnel administering these programs in the state are increasingly responding to the recently-evolving policy aimed at protecting remaining wetlands.

Wetland Protection Under State Programs

Funding of agricultural conservation practices through the State Water Conservation Fund is largely done using criteria developed by SCS. Thus, as federal technical assistance is denied where practices involve the drainage of wetlands, use of these state funds for this purpose would be increasingly limited.

Similarly, financing or other support of drainage projects by the state through its Resource Development Fund is being limited. The Fund is the largest source of state moneys for conservation projects in Nebraska and is administered by the Natural Resources Commission. An advisory committee which sets guidelines on the use of the Fund recently adopted a formal policy recommending that it not be used in funding drainage projects ("Policy Statement VI," Nebraska Resources Development Fund Advisory Board, January, 1982). Under this policy, "drainage" is defined as:

> . . . work conducted to rid land of its superfluous moisture by adopting or improving natural water courses and supplementing them, when necessary, by ditches or other artificial means. In contrast, flood control is defined as (1) a reduction in the amount of water which escapes from a stream or other natural drainageway and inundates or overflows adjacent land area, or (2) a reduction in the amount of land area inundated by water escaping from a stream or other natural drainageway.

While drainage projects will be discouraged, state funding of "flood control" projects will continue. At the same time, even though state funding of drainage projects is being constrained, drainage projects are continuing in the state by Natural Resources Districts (NRDs) with moneys raised through their own fund raising authorities. No estimate is readily available on the extent of these types of projects by local NRDs. However, several drainage projects have been undertaken in recent years in the central Platte Valley by the area NRD.

Farmers' Decisional Attitudes: A Cultural Context

In order to fully understand the decisionmaking of farmers, economically based and otherwise, involved in the development of wetland areas for more intensive agricultural use, it is important to briefly review some attitudinal analyses. Basic values, beliefs, and resulting attitudes cannot be overemphasized in explaining economic and technological actions. Although cattle are physiologically similar in Nebraska, India, and Arizona; in Nebraska they are a means to cash, in India an ancestral god, and in Arizona, among the Papago, a status symbol.

As a matter of introduction, cultural values and societal beliefs are evaluative criteria--the "oughts" and "shoulds" of society. Attitudes are human responses to objects and situations. An attitude is object- or situation-specific and a single attitude is based upon numerous beliefs. However, beliefs are determinants rather than components of attitudes (Rokeach, 1968, p. 272). Beliefs are overarching social criteria--across attitudes, objects, situations, and people--while attitudes are held by specific people about specific objects and situations.

For example, a belief in equal treatment of persons results in codified norms and also influences human attitudes and responses toward particular persons, such as blacks, males, and the handicapped. "Put another way, the objects and situations we encounter have meaning for us not only because of the attitude they activate within us but also because they are perceived to be instrumental to realization (or to stand in the way of realization) of one or more social beliefs" (Rokeach, 1968, p. 275). It is through the day-to-day attitudinal responses to symbols that the person-to-person, person-to-technology, and person-to-ecology relationships are maintained in an institutional arrangement.

Nebraska farmers, like their ancestors for centuries past, look upon land as something to be acquired and utilized, if not dominated. Therefore, we can expect that with or without many incentives to do so, farmers will be willing to drain land even if it is not necessarily profitable. In fact, profitability may often not even be considered by farmers seeking to drain wetlands. As a member of the

Nebraska Natural Resource Commission said, "If you want to make some sense out of who has used reuse pits and dugouts, you need to look at landownership patterns and who has the money. Usually it was done by farmers who tired of what they considered a problem and who had the money to do it" (Nebraska Resource Commission staff interviews, July 1982). He suggested it may never pay off in strictly monetary terms.

In regard to wildlife, farmers' attitudes are generally somewhat utilitarian and negativistic according to a social-psychological survey made of United States citizens by Stephen Kellert of Yale University (1980). The survey indicated that most United States citizens have a utilitarian and negativistic attitude toward wildlife with little scientific knowledge or ecological appreciation for the environment as a system. "Attitudes affecting considerable interest in wildlife and concern for habitat . . . were far less frequently encountered" (Kellert, 1980, p. 60).

Survey results indicated farmers are even more extremely inclined in these attitudes than the general population (Kellert, 1982, pp. 34-36). Regarding interest and affections for wildlife, farmers and livestock raisers are very low as compared to other demographic and animal activity groups respectively. What's more, they have similar positions for "the environment as a system, for interrelationships between wildlife species and natural habitats" and also a similar position with regard to scientific interest and knowledge of wildlife (Kellert, 1982, pp. 37-42, and 57).

With regard to the dominionistic attitude which is oriented around satisfactions derived from the mastery and control over animals, farmers are the top group among United States demographic groups (p. 54). "Farmers, males, Alaska and Rocky Mountain residents, blacks, and somewhat surprisingly, those of high income were the most dominionistically oriented demographic groups" (p. 49). This is also the case where the primary concern is for the practical and material (p. 50). "On the utilitarian scale, according to analysis of variance results, farmers, the elderly, blacks, and southern respondents had the highest scores" (p. 49). With regard to the negativistic attitude in which there is an active dislike or fear of wildlife, farmers are above the general population (p. 56).

Kellert's study suggests farmers' attitudes are consistent with a Nebraska Game and Parks Commission study hypothesis that wetland destruction has come mainly because of a belief that the actions of farmers associated with this are "not only acceptable but represented a resourceful individual. The popular view that a natural marsh constitutes some horrible swamp hazard, and therefore a menace to humans, helped place the marsh in low regard if not undesirable" (NGPC, 1972, p. 27).

This discussion should not be considered an indictment of farmers. Farmers inherit their beliefs just as do other groups. They don't pick them. Rather, the discussion is meant to suggest that with the kinds of beliefs and attitudes farmers have toward land and wildlife, it is not surprising that their role in the loss of wetlands has been pronounced. Historically, this is especially the case in the context of government subsidies, encouragement, technical assistance, and new technology for assisting them in developing and altering wetlands which they are continually provided.

A survey of farmers in Missouri regarding their wildlife interests found that wildlife considerations in farm management generally decreased with larger-size operations (Kirby, 1981, p. 5). At the same time, the study found that attitudes toward wildlife are much more important than cash payments and commodity values in getting farmers to maintain or protect wildlife areas. This is an important finding for policy considerations.

Of the farmers who said they would welcome assistance for improving their land for wildlife, the assistance "most favored by a plurality of respondents was 'seed for food plots' (27%), though technical advice ranked a close second (25%)" (p. 7). Cash payments ranked fifth (12%) in types of assistance preferred (p. 7). The study suggested that since "only 12% of the landowners surveyed [who would welcome assistance] selected cash payments as a desirable form of assistance," even if payments were made to these farmers, "habitat conditions on only a small portion of . . agricultural land would be affected " (p. 11).

With regard to turning wildlife into a commodity value, "conventional wisdom has long held that wildlife management on private lands would be most effective if wildlife could become a staple product of agriculture rather than a by-product. Moreover, it has been suggested that, if only given the opportunity, farmers would capitalize on the prospect of making wildlife marketable--say by accepting cash payments in return for implementing wildlife conservation practices" (p. 10). However, the Missouri survey found: "Even after an earnest appeal to simply consider cash payments, few survey participants expressed an interest" (p. 10). To the rank and file Missouri farmer, "the idea of making wildlife a staple product is an alien one" (p. 10). Therefore, "elevating wildlife to an income-generating by-product appears not to be a pressing concern in the minds of most Missoui farmers" (p. 12).

Assessing the Profitability to Farmers in Altering Wetlands

Although destruction of wetlands may fulfill "domination and negativistic attitudes" perhaps held by farmers, this section will assess whether it fulfills the utilitarian hope through increased profit. Although it is extremely difficult to generalize how particular factors involved in converting or altering wetlands will affect the overall profitability of such decisions, a general analysis is nevertheless attempted for the three main wetland areas. Cases 1 through 5 which follow are meant to reflect the types of wetland conversions occurring in the Rainwater Basin. Cases 5 though 8 apply to the Platte Valley and Cases 9 through 15 apply to the Sandhills. The deterimination to be made in all cases is whether revenues from additional crop production made possible by altering a wetland are sufficient to cover costs incurred in the alteration.

There are five common assumptions used in most cases. First, the decisional unit used in most of the analysis is that of an individual owner-operator; the major land-use decision-maker type in rural Nebraska. Second, it is assumed in all cases that initial property taxes for wetland areas are so low that they are not considered in the analysis. Taxes on wetlands in Nebraska amount to pennies and are ignored (see subsequent section on property taxation).

Third, the annual amortized cost of a reuse pit system and land leveling is calculated on the basis of a 30-year loan with interest rates at 5 percent in 1965 and increasing to 13 percent in 1980 to reflect the rates available from government sources. It is assumed that farmers pay the higher rate each year even if the reuse system loan was made in an earlier year because if a farmer had the funds available, the funds borrowed at the new higher rate for other projects could be reduced and thereby reduce interest payments. This is the case in any growing business which operates on debt financing as is the case with farmers. As soon as a farmer is committed to a new payment, it immediately becomes an ingredient in his cash-flow management. It is an expense which must be covered. Financing could be lower by the amount of the new commitment if it had not be contracted.

As an example, assume that an amortized yearly payment of \$5.00 is necessary to pay off an investment loan at 5 percent interest. The real payment per year for the first three years would be as follows:

Year	Interest Rate(%)	Increased Operating Loan		Real Cash Flow Payment
1	5	\$5(1+.05)	=	\$5.25
2	5.5	\$5.25(.055)+\$5(1+.055)	=	\$5.57
3	6.0	\$5.25(.06)+\$5.57(.06)+\$5(1+.06)	=	\$6.00

If the loan had not been contracted, the \$5.25 that was paid out in the first year would have been available without being borrowed in the second year. Since it must be borrowed, the interest on it is a real increase in the cash flow in the second year. The same procedure would apply in the third year and so on.

Fourth, in cases where government cost-sharing is assumed, costs are split with the farmers paying 40 percent and the federal government 60 percent.

Finally, it is assumed that crop production in converted wetlands is essentially lost one year out of four (25% of the time) because of conditions such as seasonal flooding. Although measures are taken to drain wetlands, they are usually not completely successful. Seasonal flooding with heavy rains, and some extended inundation in years of very heavy rainfall (such as the current year) usually occur. If heavy rains come during the corn-planting season in a dry year, it may not be possible to plant even though the altered wetland is dry most of the year. At the same time, heavy rains at harvest time may limit how much of a crop can be harvested due to soggy or inundated grounds. Crop kill occurs as well in extremely wet soils. Additionally, in some years part of an altered wetland may be flooded resulting in crop loss while the remainder may be very productive.

One farmer from the region estimated that many wetland areas that are farmed lose much of their crop every other year while another estimated every fifth year. A dugout contractor from the region said that he was never successful in keeping one wetland basin near Davenport, Nebraska, in the Rainwater Basin, free of flooding even though three pits were constructed in it with a total capacity of 30,000 cubic yards. "Frustrations resulting from these failures prompted several to comment during interviews that they wished they had their investment back" (NGPC, 1972, p. 19).

For purposes of the analysis, it is assumed that at least every fourth year a crop is lost due to flooding, or a 25 percent average annual loss. Although loss in a single wet year may not be total, it is assumed that partial losses in other years make such an assumption reasonable.

Rainwater Basin Analysis: Cases 1 through 5

Two general categories of wetland conversion are analyzed for the Rainbasin area; first the use of a reuse pit for draining a wetland and second the use of land leveling. In the approach used here, it is assumed that fixed costs of land, management and cultivation equipment don't change in farming additional acres brought about by wetland drainage or leveling. When an owner-farmer decides to convert wetlands, it is assumed that the land is already owned and the equipment base does not have to be increased for a few more acres. High-horsepower tractors that allow farmers to transverse the spongy lowlands of the Rainwater Basin area are already standard equipment.

In the cases where a reuse system is used, system costs include the pit, pump, risers, and the pipe to pump the water elsewhere; usually up a grade and back through the irrigation system. Without the pump and pipe, larger pits are usually required and costs are roughly equivalent. Cost estimates used are statewide averages and may be somewhat low for Rainbasin reuse systems which are constructed for drainage purposes as well.

Fischbach (University of Nebraska agricultural engineer), a noted authority on reuse systems and irrigation in general, has stated that a Rainbasin drainage reuse system can be four times as expensive as a system intended only for holding pumped water. A recent study by Gilley and Supalla (1982) determined that the use of a Rainbasin reuse system is usually not financially feasible unless the main well is pumping deeper than over 200 feet (pp. 16-17). This becomes more true as the cost of energy increases since reused water must usually be pumped up a grade and back into the irrigation system.

The analysis assumes that the Rainbasin reuse system will drain 10 acres of wetland on average. Again, variability made this acreage determination very difficult. One person related a case of a reuse system which regularly drains 25 acres in about 2 weeks after heavy rains. In others, only a few acres may be effectively drained. The systems can be very effective because they not only drain the volume of the pit, but the soil from the pit is also used as fill material. Many pits break through the clay pan and thus in some soils increase percolation. The 1960s NGPC survey noted that 70 percent of the Rainbasin wetlands were lost as a result of drainage and that "seventy percent of the destroyed basins were smaller than 10 acres, and 93 percent were 25 acres or less" (NGPC, 1972, p. 25).

Where the analysis includes government cost-sharing assistance, payment limits before 1980 of $2,500 and $3,500 beginning in 1980 are used and reflected in amortized conversion costs of reuse systems.

Finally, the time period used in the Rainbasin cases is 1965 through 1980.

Platte River Valley Analysis: Cases 6 through 8.

The Platte Valley cases differ from the Rainwater Basin drainage cases in that explicit action to drain the riparian wet meadows through leveling or reuse systems is not assumed. The analysis assumes additional cropland is gained as wet meadow areas are lost through a general lowering of the water table. Therefore, the tables for these cases have zeros in the columns indicating the farmer's conversion costs.

While gaining arable land, farmers lose a hay crop from the drained hay meadows; a crop which did not require cultivation. Lost revenues reflecting this hay loss are deducted from revenues gained through cropping. Average hay revenue for hay and grazing per acre for the region was used in the analysis to indicate the farmer's losses even though evidence suggests that hay production in these areas is above average.

Sandhills Analysis: Cases 9 through 15.

The analysis for the Sandhills wetlands differs considerably from the previous two. The Sandhills are a special case because of the tremendous variability of geography and management capability in the Sandhills, and the consequent variability of costs, production, and profits. In addition, the main concern here--that of converting sometimes marginal land to center pivot irrigation--does not have a long enough history to establish a reliable data base.

A center pivot system impacts on wetlands in numerous ways. Sometimes sprinkler systems pass over or through wetlands on small elevated tracks. Land-shaping such as cutting drainage paths and removing the tops of hills and filling low spots often precedes installation of a center pivot system. Wetlands can be indirectly impacted by regional groundwater drawdown. Therefore, wetlands aren't considered individual entities as in the Rainbasin and Platte River areas. Profitability of installing center pivot systems as a whole is considered.

Land-shaping costs in the Sandhills for irrigation vary with the terrain. Best estimates place landshaping costs at from $4,000 to $26,000 per pivot (interviews with Sheffield and Fischer, University of Nebraska agricultural economists, August 82). Higher land-shaping costs occur for land of rougher terrain with many lowlands in the swing of a pivot.

Many recent conversions from rangeland to cropland under center pivot irrigation have been in areas of very sandy loam and fine sand. Generally government cost-sharing is not available for these conversions because the agencies believe them to be a poor investment both for financial and environmental reasons (consultation with state ASCS and Farmers Home Administration personnel and SCS range conservationists, July-August, 1982).

Two kinds of decisionmakers are assumed for the Sandhills cases. The first is an owner-operator who is converting his own rangeland to irrigation. The other is a developer (individual investor or investment syndicate) who buys rangeland to convert it to irrigation. Management and land costs are not included in the first set of cases because they are already being accrued by the rancher before the conversion to center pivot irrigation.

Estimates of corn yields on recently installed pivots in the Sandhills vary tremendously. Fischer (University of Nebraska agricultural economist) estimates a high of around 100 bushels per acre (personal communication, August 19, 1982). Jensen (state SCS range conservationist) says that it is common in the first two to three years after conversion to have almost no production (personal communication, August 19, 1982) while Sheffield (University of Nebraska agricultural economist) believes that the corn production range is between 75 to 130 bushels per acre (personal communication, August, 1982). Production at three yield levels are used in the analysis; 75, 100, and 130 bushels per acre.

Case 1: Rainbasin Irrigated Corn Farm with Reuse Pit Conversion

Farmer is a gravity irrigator (with his own well) who extends his irrigated acres through installation of a reuse pit for drainage in order to increase corn production acreage. Estimates of the monetary results of this decision are contained in the Case 1 table (at end of section) and explained column-by-column as follows:

Column 1: Corn Output Per Acre

After conversion the wetlands, because of the rich soil and the availability of water, begin producing a good yield in the first year (yield is derived from documented averages for Clay, Fillmore, York, and Hamilton counties, Nebraska Agricultural Statistics).

Column 2: Revenue Per Acre

The revenue per acre from the sale of the corn is derived using annual corn price data (Nebraska Agricultural Statistics).

Column 3: Revenue Lost Due to Flooding

The assumed loss due to wetness and periodic inundation is 25 percent of Column 2.

Column 4: Revenue Per Acre

This assumed 25 percent average annual crop loss is deducted in calculating the normal revenue per acre in the region to find the revenue in the converted wetland.

Column 5: Variable Cost Per Acre

The variable cost per acre is taken from the annual Estimated Crop and Livestock Production Costs (University of Nebraska-Lincoln Agricultural Economics Extension) for central Nebraska and includes direct labor, interest on operating expense, custom hire and machine rental, fuel and lube, and purchased materials. The latter includes fertilizer, herbicide, seed, etc. Fixed costs such as machinery costs and interest on land along with overhead and management are not included.

Since the variable cost data goes back to 1975 from this source, annual costs back to 1965 were calculated using price indices from the *Statistical Reporting Service* of the Agricultural Crop and Livestock Reporting Service of the Nebraska Department of Agriculture.

Column 6: Property Taxes Per Acre

Property taxes for central Nebraska are also taken from the annual *Estimated Crop and Livestock Production Costs*. There is no published record of property taxes per acre before 1975 so Column 6 was projected back for 1965-1974 at the same rate of change as existed for 1975-1980.

Column 7: Farmer's Amortized Conversion Cost Per Acre

The reuse system was amortized as explained above. The figures used for determining cost were taken from the *Estimated Crop and Livestock Production Costs*. However, contractors and government agencies providing technical assistance such as SCS were also contacted for verification. Cost estimates range from approximately $2,000 in 1965 to $6,600 in 1980. It is assumed that the farmer pays 40 percent of that cost (public cost-sharing is extended).

Column 8: Depreciation of Conversion Systems

According to the *Estimated Crop and Livestock Production Costs*, the system should be depreciated at a rate of 4 percent per year. These figures reflect that rate.

Column 9: Profit Per Acre Before Income Taxes

The yearly profit is found by subtracting Columns 5-8 from Column 4.

Column 10: Government Amortized Conversion Cost Per Acre

The government's cost share of 60 percent is amortized to indicate the amount of the subsidy each year if the farmer were paying that share as well with the same loan terms as on the 40 percent share in Column 7.

Case 2: Rainbasin irrigated Corn Without Government Cost-Sharing for Reuse Pit

Case 2 is based on the same assumptions and sources as Case 1 except the assumption is now made that the government does not participate in sharing the cost of the reuse pit. This will change columns 7, 9, and 10 as follows.

	Farmers' Amortized Conversion Cost Per Acre (40%)	Profit Per Acre Before Income Taxes	Government Amortized Conversion Cost Per Acre (60%)
1965	12.95	8.79	0
1966	14.31	14.87	0
1967	15.69	- 1.15	0
1968	17.23	- 4.52	0
1969	19.34	5.78	0
1970	21.25	3.97	0
1971	23.45	- 8.33	0
1972	25.79	37.01	0
1973	28.81	86.71	0
1974	35.39	87.53	0
1975	44.77	27.37	0
1976	51.75	6.39	0
1977	59.24	33.30	0
1978	66.95	- 2.11	0
1979	74.49	17.13	0
1980	84.99	-66.02	0

Case 3: Rainbasin Irrigated Alfalfa with Reuse System

In Case 3 the assumptions, approach and sources are the same as in Case 1 except that the crop involved is alfalfa.

Case 4: Rainbasin Dryland Wheat with Reuse Conversion

In Case 4 the assumptions, approach and sources are the same as in Case 1 except the crop involved is wheat which is not irrigated.

Case 5: Rainbasin Irrigated Corn Farm with Leveling Conversion

Case 5 is constructed very similar to Case 1 except the conversion for irrigation and cropping is via leveling rather than a reuse system. Therefore, the amortized cost and depreciation are different. The cost of leveling and applicable depreciation rate are taken from the annual *Estimated Crop and Livestock Production Costs*. These are average figures for the region and may underestimate wetland leveling cost which may include building embankments and dikes.

Case 6: Platte Riparian Irrigated Corn Farm; Conversion with Declining Water Table

The sixth case illustrates conversion of a Platte River wet meadow area from hay to corn production. The estimated value of lost hay production is deducted from the additional corn revenue in Column 5. The Platte Valley farmer-stockman receives what is sometimes referred to as a "natural subsidy" which makes the hay input for his cattle essentially free. There is essentially no cost for hay if grazed. That is the assumption made here. The state SCS range conservationist estimates that the hay production would be approximately 2.5 to 3 ton in the area (SCS, 1981, p. 1). If grazed, the value as a cattle input is approximately 1 ton per acre less than this average which is the basis for Case 6. Since there is no other assumed conversion cost to the farmer, Columns 8, 9, and 11 are without entries. The hay revenue is taken from *Nebraska Agricultural Statistics*. The other columns are from the same sources as Case 1.

Case 7: Platte Riparian Irrigated Alfalfa; Conversion with Declining Water Table

Case 7 is the same analysis as Case 6 except it is for irrigated alfalfa instead of corn.

Case 8: Platte Riparian Dryland Wheat: Conversion with Declining Water Table

Case 8 is the last analysis for the Platte Valley. It is accomplished in the same manner as Case 6 except it is for dryland wheat production.

Cases 9, 10, and 11: Sandhills Corn Production; Rancher Conversion via Center Pivot Irrigation with Varying Landshaping Costs

The production costs in Cases 9, 10, and 11 are an average of the last three years for a 130-acre pivot as found for the region in the *Estimated Crop and Livestock Production Costs*. The corn price used of $2.80 is an average of the last three years. That compares with a corn price of $2.50 for the last ten years (*Nebraska Agricultural Statistics*).

Cases 12, 13, and 14: Sandhills Corn Production; Developer Conversion via Center Pivot Irrigation with Varying Landshaping Costs

Cases 12, 13, and 14 add the costs from Cases 9, 10, and 11 to the average land, overhead, and management costs for the region in order to represent the developer who is buying the land as a new investment.

Case 15: Sandhills Irrigated Cow-Calf Operation with Center Pivot System

The last case to be considered is expansion of the carrying capacity of a Sandhills cow-calf ranching operation with a 240-acre center pivot irrigation system. The example was constructed by Robert Perry (District Extension Economist for the UNL Agricultural Economics North Platte Nebraska Station). The case is reproduced directly from his "Irrigation in the Sandhills: Evaluating A Change in Net Income" (1981, p. 5). The assumptions are of an owner-operator who produces 210 acres of irrigated grass and 30 acres of irrigated alfalfa. It will increase the cow herd by 132 head and make it possible to sell 62 more steer calves, 41 more heifer calves, 20 more cull cows and 2 cull bulls each year. The conversion also eliminates $8,000 in protein costs. No additional equipment or labor is needed beyond the installation of the sprinkler system.

Case 15: Conversion to Irrigated Grassland by Sandhills Rancher

Added Income:	
Steer Calves	$23,265
Heifer Calves	12,885
Cull Cows	9,801
Cull Bulls	1,560
Reduced Costs:	
Protein Purchase	8,000
Added Income Plus Reduced Costs	$55,511
Decreased Income:	$ 0
Increased Costs:	
Interest on Investments	$16,022
Depreciation on Investments	13,378
Repairs on Irrigation	3,226
Fertilizer	9,922
Irrigation Fuel & Oil	12,900
Fuel, Oil & Twine for Alfalfa	250
Added Costs for Cows	3,951
Interest on Added Oper. Costs (16%, 1/3 year)	1,613
Decreased Income + Increased Costs	$61,262
Change in Net Income	- $ 5,751

Source: Perry, 1981

Summary of the Profitability of Wetland Conversion in Nebraska

The profitability of converting wetlands for expanded (or different) agricultural use under the assumptions contained in these 15 cases is summarized in the table on the following page. In most of the cases, the types of conversion now occurring in Nebraska have questionable profitability. In fact, in many cases, farmers and ranchers would actually incur losses by converting wetlands.

For the Rainwater Basin, average net receipts on the converted acres are positive under Cases 1, 2 and 5. However, these returns are modest ranging from $10.46 per acre for Case 2 (annual average for the 16-year period using actual dollars) to $57.24 for Case 5. Case 2 (producing irrigated corn on wetlands drained with the installation of a reuse pit system) is probably the most common situation today in the Rainwater Basin. If government cost-shares are extended, profitability under this situation increases to $30.32 per acre (Case 1).

Where Rainbasin wetlands can be effectively filled by leveling, wetland conversion to irrigated corn production is most profitable. This type of conversion would be most common where smaller, shallower wetlands are involved. For larger and deeper ones, leveling is far less

Converting Platte Valley wet meadows used as pastures to irrigated corn or alfalfa production would not appear to be profitable (Cases 6 and 7). This is in part due to the assumed substitution of the production from one form of irrigation which is increasingly expensive (groundwater pumping) for the different production of another form of irrigation which is essentially costless (natural subirrigation).

In the Sandhills, converting land containing wetlands to irrigated corn using center pivots may be profitable for ranchers if land-shaping costs are low and yields high. Where Sandhills land is more suitable for irrigated row-crop production, this combination of factors may occur. On more marginal lands, profitability would be doubtful.

The analysis is structured so that land and management costs are not included. If they are, then the conversions would have shown

SUMMARY OF CASE ANALYSES; 1 - 15: PROFITABILITY OF ASSUMED WETLAND CONVERSIONS

Cases	Annual Net Revenue Per Acre			Ave. Annual Govt. Asst. Per Acre
	16-yr. Ave.	Low (year)	High (year)	
Rainwater Basin				
Case 1: Irrigated Corn/Reuse	$ 30.32	- 20.95 (80)	108.76 (74)	$19.86
Case 2: Irrigated Corn/Reuse	10.46	- 66.02 (80)	87.53 (74)	NONE
Case 3: Irrigated Alfalfa/Reuse	- 22.24	- 93.51 (78)	39.58 (74)	19.86
Case 4: Dryland Wheat	- 7.84	- 42.71 (77)	51.30 (73)	19.86
Case 5: Irrigated Corn/Leveling	57.24	19.27 (68)	132.13 (74)	5.88
Platte Riparian Wet Meadows				
Case 6: Irrigated Corn	- 18.92	- 71.40 (80)	34.35 (74)	NONE
Case 7: Irrigated Alfalfa	- 84.67	-142.12 (80)	- 43.46 (66)	NONE
Case 8: Dryland Wheat	- 59.00	-118.30 (76)	- 15.37 (73)	NONE
Sandhills Center Pivot Development				
Case 9: A. Rancher $4,000/75 Bu.	- 96.85			NONE
B. Rancher $4,000/100 Bu.	- 26.85			NONE
C. Rancher $4,000/130 Bu.	57.15			NONE
Case 10: A. Rancher $15,000/75 Bu.	-112.57			NONE
B. Rancher $15,000/100 Bu.	- 42.57			NONE
C. Rancher $15,000/130 Bu.	41.43			NONE
Case 11: A. Rancher $26,000/75 Bu.	-129.34			NONE
B. Rancher $26,000/100 Bu.	- 59.34			NONE
C. Rancher $26,000/130 Bu.	24.66			NONE
Case 12: A. Developer $4,000/75 Bu.	-140.37			NONE
B. Developer $4,000/100 Bu.	- 70.37			NONE
C. Developer $4,000/130 Bu.	13.63			NONE
Case 13: A. Developer $15,000/75 Bu.	-156.09			NONE
B. Developer $15,000/100 Bu.	- 86.09			NONE
C. Developer $15,000/130 Bu.	- 2.09			NONE
Case 14: A. Developer $26,000/75 Bu.	-172.34			NONE
B. Developer $26,000/100 Bu.	-102.34			NONE
C. Developer $26,000/130 Bu.	- 18.34			NONE
Case 15: Rancher/Cattle	- 5,751			NONE

losses. (For example, according to Estimated Crop and Livestock Production Costs, management and fixed costs in 1980 for Case 1 are $169.96 per acre).

Where additional land and management costs are included as with developers (Cases 12, 13, and 14), the profitability of Sandhills rangeland conversion to irrigated corn production is increasingly doubtful irregardless of land factors involved.

It should be noted that this analysis ignored the effects of federal tax provisions on profitability. Tax subsidies in varying amounts can be received by developers as well as owner-operators through these types of investments via the capital gains exemption, investment tax credit, and capital cost-recovery provisions that, among other things, permit the full depreciation of irrigation equipment over five years. Variability in the degree to which different types of investors may benefit from such tax provisions precluded consideration of their effects in the analysis.

Wealth effects or the effects of these types of conversion on the value of land were ignored in the analysis as well. Although values may be enhanced when the potential of land for agricultural production is improved, these increased values must ultimately be justified in terms of compensatory increases in net cash receipts through their expanded use. Hence, profitability was determined to be the overriding consideration.

In general for all three regions, wetland conversion possibilities will likely become even less profitable in the years ahead. Agricultural costs will continue to rise while commodity prices remain depressed for some time to come. At the same time, public assistance to defray part of the costs of wetland conversion appears less and less likely.

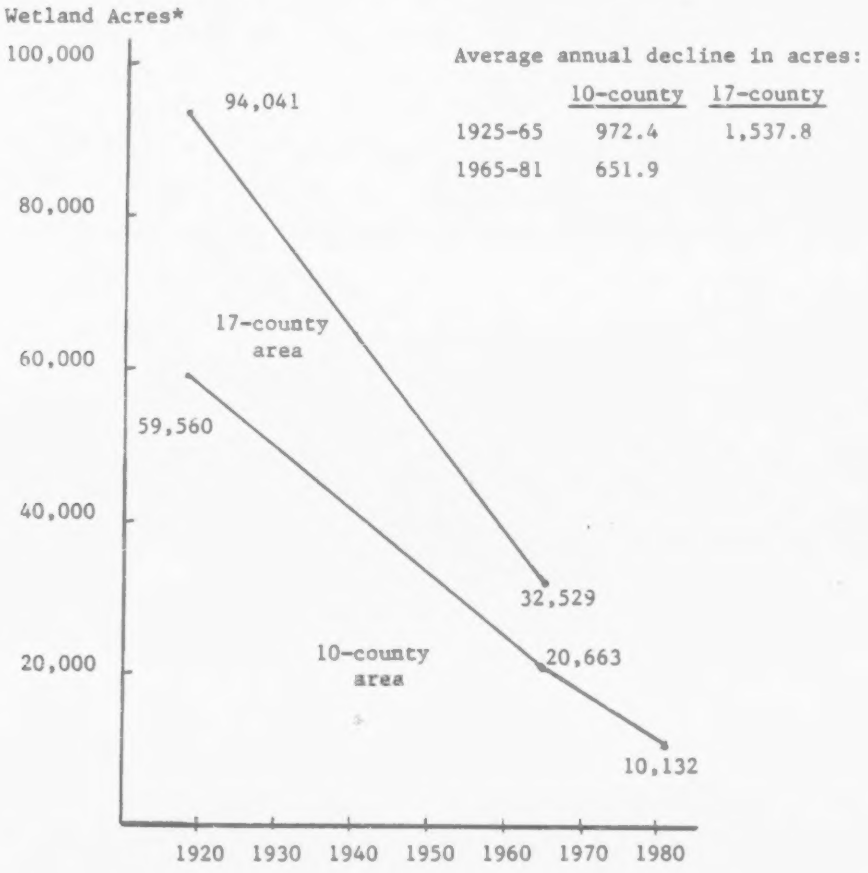
Economic Impact of Wetland Conversion in the Rainwater Basin

An attempt was made to generally assess the impact of wetland conversion activity on a region's economic base. The Rainwater Basin region is the only one analyzed because of the great fluctuations in the estimates of acres lost to conversion in the Platte and Sandhills' regions.

The impact on the state economy of investment expenditures made to drain and convert wetlands for expanded agricultural use and of new crop production resulting from this conversion are estimated using economic multiplier analysis. In the case of an increase in expenditures, the regional income will increase a multiple of the initial increase in expenditures. This multiplication process is a consequence of each recipient of income respending part it which, in turn, becomes new income to someone else who also spends part of it and so forth. The actual multipliers used are taken from a recently updated input-output analysis of the Nebraska economy (Lamphear and Roesler, 1970 Nebraska Input-Output Tables, updated using 1976 data).

Based upon an average derived from two NGPC wetland surveys of the area (1972 and 1981), an estimated 1095 acres of wetlands have been "lost" annually in recent years in a 17-county Rainwater Basin area (see figure below). Nearly all of this loss is attributed to expanded agricultural use (NGPC staff interview, July 1982).

ESTIMATES OF WETLAND LOSS TREND IN THE RAINWATER BASIN



*derived from NGPC, 1972 & 1981

In achieving this conversion of wetlands over the last 15 years, it is generally estimated that 70 percent of the new cultivated farmland resulted from reuse system drainage, 20 percent from leveling, and 10 percent from other sources (arrived at through numerous interviews with agency personnel and field persons). For 70 percent of the acres converted each year, the investment cost per acre for this conversion is derived from previous reuse pit cost estimates (see Case 1). Likewise for 20 percent of the acres, the investment cost is derived from earlier leveling cost estimates (see Case 5). Column 2 of the table below shows what these investment totals would have been under these assumptions.

RAINWATER BASIN ECONOMIC IMPACT FROM THE CONVERSION OF WETLANDS TO IRRIGATED AGRICULTURE

Year	1 Tillable Acres Gained	2 Investment Expenditure for Conversion	3 New Corn Produced (bu.)	4 Revenue Received From Corn Production	5 Payments on Conversion Loans	6 Total Income Changes
1965	1,095	$164,140.50	85,426	$ 94,575.15	$ 10,686.11	$561,436.68
1970	1,095	207,064.50	89,943	109,445.25	83,141.66	520,453.74
1975	1,095	348,210.00	92,456	226,062.75	213,682.11	781,419.49
1980	1,095	542,024.00	76,195	232,205.70	491,468.77	571,463.53

If all of the converted wetland acreage is considered used for corn production and we use average per acre corn production (see Case 1) as a proxy for agricultural potential, estimates of additional corn production and revenue for the region can be calculated (Columns 3 and 4). It is important to note that this estimated new production is less than one-tenth of one percent of the total corn production in the seventeen-county region.

If it is assumed that farmers in the region pay for the investment themselves without borrowed funds, then the investment itself will essentially have no net impact because the farmers take the funds away from income that would have gone to alternative expenditures. Thus the gain of one expenditure is balanced against the loss of another to the region.

However if it is assumed that farmers finance the reuse pits and leveling through borrowed funds exogeneous to the system such as through borrowing funds created by a local bank or borrowing from the Farmers Home Administration, then the investment will have a multiple impact. In the case of financing through exogeneous funds, the multiplied effect will be equal to the investment multiplier times Column 2. The investment multiplier used is 2.39 which is the investment multiplier applicable to the special trade contractor's I-O sector which includes miscellaneous specialized construction such as industrial machinery and equipment installation as well as water-well drilling.

In addition to the investment multiplier, there will also be a multiplier effect resulting from the region supplying the input requirements necessary to produce corn on the converted acreage. New revenue injected into the economy due to new production will have a multiplier effect like other new expenditures. The economic multiplier for the irrigated crops I-O sector is 2.11. This is the impact on the economy and its producing sectors of supplying an additional dollar of irrigated corn to final output. This includes the original dollar increase itself plus the direct and indirect requirements placed on the economy in supplying the dollar of output. Direct and indirect requirements include the activities of input suppliers to agriculture such as seed, chemicals and fuel suppliers, etc. The total impact is found by multiplying Column 4 times 2.11.

In addition to the positive multiplier effects, there is a negative one as farmers pay off loans acquired to establish the conversion systems. Using the per acre amortization information from above (see Cases 1 and 5), Column 5 shows the total regional loan payment per year. Total payments grow each year due to the accumulation of new conversion each year and due to increasing interest rates. The full impact of repaying the loans with funds that would otherwise be in the region's spending stream is derived from the household-income multiplier. The household multiplier found in the input-output tables is 2.47. Therefore 2.47 times Column 5 reflects the negative impact from repaying investment loans.

The net result of these presumed multiplier effects is shown in Column 6. The resulting income created in converting wetlands in the Rainwater Basin for irrigated corn is less than 1/100 of a percent (.000072) of State Personal Income and around 6/100 (.00056) of the

17-county Rainwater Basin area Personal Income.

An alternative to consider is the case where some of the conversions receive financing from the federal ASCS program. If it is assumed that 25 percent of the conversions received federal cost-sharing assistance of 60 percent, then private loan payments would be 15 percent (.25 x .60) less than in Column 5 (assuming that federal taxes are not increased in the region as a consequence). The negative multiplier effect is also reduced and the total income change (Column 6) is increased to $565,396 in 1965; $551,297 in 1970; $860,588 in 1975; and $753,552 in 1980. This would be approximately .00008 of State Personal Income and .0006 of the seventeen-county Personal Income.

CASE 1 -- CORN PRODUCTION AND PROFIT FROM THE CONVERSION OF RAINBASIN (AREA 1) WETLANDS TO IRRIGATED AGRICULTURAL USE VIA A REUSE PIT

	1	2	3	4	5	6	7	8	9	10
Year	Output Per Acre	Revenue Per Acre	Revenue Lost Per Acre Due to Flooding (Col. 2)(.25)	Revenue Per Acre Col. 2 - Col. 3)	Variable Cost Per Acre (Gravity Irrigated)	Property Taxes Per Acre	Farmers' Amortized Convertion Cost Per Acre (40%)	Depreciation of Conversion System (4% of Original)	Profit Per Acre Before Income Taxes	Government Amortized Conversion Cost Per Acre (60%)
1965	104.02	115.16	28.79	86.37	53.00 (est)	3.67	5.18	7.96	16.56	7.77
1966	111.14	127.61	31.90	95.71	53.96	4.25	5.72	8.32	23.46	8.59
1967	109.45	110.67	27.67	83.00	54.99	4.83	6.28	8.64	8.26	9.41
1968	105.25	110.58	27.64	82.94	55.81	5.42	6.89	9.00	5.82	10.34
1969	121.06	129.51	32.38	97.13	56.41	6.00	7.74	9.60	17.38	11.60
1970	109.52	133.26	33.31	99.95	58.11	6.58	8.50	10.04	16.72	12.75
1971	116.08	124.96	31.24	93.72	60.87	7.17	9.38	10.56	5.74	14.07
1972	127.27	193.78	48.44	145.34	63.71	7.75	10.32	11.08	52.48	15.47
1973	114.86	273.18	68.29	204.89	69.20	8.33	11.52	11.84	104.00	17.29
1974	109.48	311.60	77.90	233.70	87.94	8.92	14.16	13.92	108.76	21.23
1975	112.58	275.26	68.81	206.45	107.93	9.50	17.91	16.88	54.23	26.86
1976	118.36	242.87	60.72	182.15	109.03	9.00	24.12	18.76	21.24	27.63
1977	110.87	220.71	55.18	165.53	107.99	11.00	30.48	20.60	-4.54	28.76
1978	132.86	295.35	73.84	221.51	123.27	11.00	37.06	22.40	27.78	29.89
1979	134.54	327.16	81.79	245.37	118.75	11.00	43.45	24.00	48.17	31.04
1980	92.78	282.75	70.69	212.06	153.69	13.00	39.92	26.40	-20.95	45.07

CASE 3 -- ALFALFA PRODUCTION AND PROFIT FROM THE CONVERSION OF RAINBASIN WETLANDS TO IRRIGATED AGRICULTURAL USE VIA A REUSE PIT

Year	1 Output Per Acre	2 Revenue Per Acre	3 Revenue Lost Per Acre Due to Flooding (Col. 2)(.25)	4 Revenue Per Acre (Col. 2 - Col. 3)	5 Variable Cost Per Acre (Gravity Irrigated)	6 Property Tax Per Acre	7 Farmer's Amortized Conversion Cost Per Acre (40%)	8 Depreciation of Conversion System (4% of Original)	9 Profit Per Acre Before Income Taxes	10 Government Amortized Conversion Cost Per Acre (60%)
1965	3.85	75.85	18.96	56.89	54.00	3.67	5.18	7.96	-13.92	7.77
1966	4.23	99.27	24.82	74.75	56.00	4.25	5.72	8.32	.46	8.59
1967	3.78	77.56	19.39	58.17	58.07	4.83	6.28	8.64	-19.65	9.41
1968	4.13	85.88	21.47	64.41	60.49	5.42	6.89	9.00	-17.39	10.34
1969	4.89	95.63	23.91	71.72	63.33	6.00	7.74	9.60	-14.95	11.60
1970	3.84	83.61	20.90	62.71	66.32	6.58	8.50	10.04	-28.73	12.75
1971	4.22	145.29	36.32	108.97	69.64	7.17	9.38	10.56	12.22	14.07
1972	3.99	101.57	25.39	76.18	72.78	7.75	10.32	11.08	-25.75	15.47
1973	4.49	145.02	36.25	108.77	77.94	8.33	11.52	11.84	-.86	17.29
1974	4.41	225.74	56.43	169.31	92.73	8.92	14.16	13.92	39.58	21.23
1975	3.39	166.69	41.67	125.02	96.95	9.50	17.91	16.88	-16.22	26.86
1976	3.78	217.04	54.26	162.78	118.16	9.00	24.12	18.76	-7.26	27.63
1977	4.81	195.71	48.93	146.78	134.02	11.00	30.48	20.60	-49.32	28.76
1978	4.69	167.01	41.75	125.26	148.31	11.00	37.06	22.40	-93.51	29.89
1979	4.81	197.15	49.29	147.86	143.31	11.00	43.45	24.00	-73.90	31.04
1980	4.87	265.52	66.38	199.14	167.40	13.00	39.92	26.40	-46.58	45.07

CASE 4 -- WHEAT PRODUCTION AND PROFIT FROM THE CONVERSION OF RAINBASIN WETLANDS TO NON-IRRIGATED AGRICULTURAL USE VIA A REUSE PIT

	1	2	3	4	5	6	7	8	9	10
Year	Output Per Acre	Revenue Per Acre	Revenue Lost Per Acre Due to Flooding (Col. 2)(.25)	Revenue Per Acre (Col. 3 - Col. 2)	Variable Cost Per Acre	Property Tax Per Acre	Farmer's Amortized Conversion Cost Per Acre (40%)	Depreciation of Conversion System (4% of Original)	Profit Per Acre Before Income Taxes	Government Amortized Conversion Cost Per Acre (60%)
1965	20.53	28.36	7.09	21.27	22.50	3.67	5.18	7.96	-18.04	7.77
1966	35.49	60.45	15.11	45.34	22.97	4.25	5.72	8.32	4.08	8.59
1967	25.77	35.89	8.97	26.92	23.45	4.83	6.28	8.64	-16.28	9.41
1968	38.17	47.96	11.99	35.97	24.04	5.42	6.89	9.00	-9.38	10.34
1969	33.32	41.38	10.34	31.04	24.53	6.00	7.74	9.60	-16.83	11.60
1970	40.49	52.81	13.20	39.61	25.22	6.58	8.50	10.04	-10.73	12.75
1971	44.50	59.34	14.83	44.51	26.42	7.17	9.38	10.56	-9.02	14.07
1972	36.51	67.20	16.80	50.40	27.07	7.75	10.32	11.08	-5.82	15.47
1973	37.93	150.73	37.68	113.05	30.06	8.33	11.52	11.84	51.30	17.29
1974	41.14	161.67	40.42	121.25	36.90	8.92	14.16	13.92	47.35	21.23
1975	26.44	95.67	23.92	71.75	44.96	9.50	17.91	16.88	-17.50	26.86
1976	33.24	85.22	21.30	63.92	43.37	9.00	24.12	18.76	-31.33	27.63
1977	32.60	78.15	19.54	58.61	39.24	11.00	30.48	20.60	-42.71	28.76
1978	29.88	90.92	22.73	68.19	34.08	11.00	37.06	22.40	-36.35	29.89
1979	32.11	122.26	30.56	91.70	37.33	11.00	43.45	24.00	-24.08	31.04
1980	43.67	169.54	42.38	127.16	37.91	13.00	39.92	26.40	-9.93	45.07

CASE 5 — CORN PRODUCTION AND PROFIT FROM THE CONVERSION OF RAINBASIN WETLANDS TO IRRIGATED AGRICULTURAL USE VIA LAND LEVELING

Year	1 Output Per Acre	2 Revenue Per Acre	3 Revenue Lost Per Acre Due to Flooding (Col. 2) (.25)	4 Revenue Per Acre (Col. 2 - Col. 3)	5 Variable Cost Per Acre (Gravity Irrigated)	6 Property Tax Per Acre	7 Farmer's Amortized Conversion Cost Per Acre (40%)	8 Depreciation of Conversion System (1% of Original)	9 Profit Per Acre Before Income Taxes	10 Government Amortized Conversion Cost Per Acre (60%)
1965	104.02	115.16	28.79	86.37	53.00	3.67	1.39	.53	27.78	2.08
1966	111.14	127.61	31.90	95.71	53.96	4.25	1.54	.56	35.40	2.31
1967	109.45	110.67	27.67	83.00	54.99	4.83	1.68	.58	20.92	2.53
1968	105.25	110.58	27.64	82.94	55.81	5.42	1.84	.60	19.27	2.75
1969	121.06	129.51	32.38	97.13	56.41	6.00	2.06	.64	32.02	3.10
1970	109.52	133.26	33.31	99.95	58.11	6.58	2.27	.67	32.32	3.40
1971	116.08	124.96	31.24	93.72	60.87	7.17	2.52	.71	22.45	3.79
1972	127.27	193.78	48.44	145.34	63.71	7.75	2.75	.74	70.39	4.13
1973	114.86	273.18	68.29	204.89	69.20	8.33	3.08	.79	123.49	4.61
1974	109.48	311.60	77.90	233.70	87.94	8.92	3.78	.93	132.13	5.68
1975	112.58	275.26	68.81	206.45	107.93	9.50	4.80	1.13	83.09	7.20
1976	118.36	240.87	60.72	182.15	109.03	9.00	5.57	1.26	57.29	8.36
1977	110.87	220.71	55.18	165.53	107.99	11.00	6.35	1.38	38.81	9.52
1978	132.86	295.35	73.84	221.51	123.27	11.00	7.17	1.50	78.57	10.76
1979	134.54	327.16	81.79	245.37	118.75	11.00	7.45	1.50	106.67	11.17
1980	92.92	282.75	70.69	212.06	153.69	13.00	8.50	1.65	35.22	12.74

CASE 6 -- CORN PRODUCTION AND PROFIT FROM THE CONVERSION OF PLATTE RAPARIAN WETLANDS TO IRRIGATED AGRICULTURAL USE

Year	1 Output/ Acre	2 Average Revenue/ Acre	3 Revenue Per Acre After Flooding Loss (Col. 2)(.75)	4 Lost Hay Revenue Per Acre	5 Revenue Per Acre (Col. 3 - Col. 4)	6 Variable Cost Per Acre	7 Property Taxes Per Acre	8 Farmer's Amortized Conversion Cost Per Acre	9 Depreciation of Conversion System	10 Profit Per Acre Before Income Taxes	11 Government Amortized Conversion Cost Per Acre
1965	98.77	605.82	79.37	40.90	38.47	53.00	3.67	0	0	-18.20	0
1966	105.03	114.35	85.76	43.13	42.63	53.96	4.25	0	0	-15.58	0
1967	104.40	101.60	76.20	41.36	34.84	54.99	4.83	0	0	-24.98	0
1968	104.66	106.68	80.01	43.80	36.21	55.81	5.42	0	0	-25.02	0
1969	124.84	125.71	94.20	50.51	43.77	56.41	6.00	0	0	-18.64	0
1970	118.72	134.61	100.96	47.07	53.89	58.11	6.58	0	0	-10.80	0
1971	116.67	121.70	91.28	57.71	33.57	60.87	7.17	0	0	-34.47	0
1972	129.68	189.22	141.92	71.97	69.95	63.71	7.75	0	0	-1.51	0
1973	112.67	256.63	192.47	93.64	98.83	69.20	8.33	0	0	21.30	0
1974	116.60	309.71	232.28	101.07	131.21	87.94	8.92	0	0	34.35	0
1975	123.32	281.68	211.26	121.33	89.93	107.93	9.50	0	0	-27.50	0
1976	120.45	230.75	173.06	116.62	56.44	109.03	9.00	0	0	-61.59	0
1977	119.93	228.93	171.70	92.10	79.60	107.99	11.00	0	0	-39.39	0
1978	128.55	286.40	212.55	98.48	114.07	123.27	11.00	0	0	-9.20	0
1979	134.41	323.69	242.77	113.14	129.63	118.75	11.00	0	0	-.12	0
1980	104.24	313.94	235.46	140.17	95.29	153.69	13.00	0	0	-71.40	0

CASE 7 -- ALFALFA PRODUCTION AND PROFIT FROM THE CONVERSION OF PLATTE RAPARIAN WETLANDS TO IRRIGATED AGRICULTURAL USE

	1	2	3	4	5	6	7	8	9	10	11
Year	Output/ Acre	Average Revenue/ Acre	Revenue Per Acre After Flooding Loss (Col. 2)(.75)	Lost Hay Revenue Per Acre	Revenue Per Acre (Col. 3 - Col. 4)	Variable Cost Per Acre	Property Taxes Per Acre	Farmer's Amortized Conversion Cost Per Acre	Maintenance or Depreciation of Conversion System	Profit Per Acre Before Income Taxes	Government Amortized Conversion Cost Per Acre
1965	3.94	72.82	54.62	40.90	13.72	54.00	3.67	0	0	-43.95	0
1966	3.86	79.89	59.92	43.13	16.79	56.00	4.25	0	0	-43.46	0
1967	3.40	63.95	47.96	41.36	6.60	58.07	4.83	0	0	-56.30	0
1968	3.93	77.17	57.88	43.80	14.08	60.49	5.42	0	0	-65.91	0
1969	4.30	79.10	59.33	50.51	8.82	63.33	6.00	0	0	-60.41	0
1970	3.75	74.99	56.24	47.07	9.17	66.32	6.58	0	0	-63.73	0
1971	4.12	84.44	63.33	57.71	5.62	69.64	7.17	0	0	-70.60	0
1972	4.00	102.08	76.56	71.97	4.59	72.78	7.75	0	0	-75.94	0
1973	4.10	134.65	100.99	93.64	7.35	77.94	8.33	0	0	-78.92	0
1974	4.06	171.49	128.62	101.07	27.55	92.73	8.92	0	0	-74.10	0
1975	4.07	177.81	133.36	121.33	12.03	96.95	9.50	0	0	-94.42	0
1976	4.12	206.72	155.04	116.62	38.42	118.16	9.00	0	0	-88.74	0
1977	4.29	137.36	103.02	92.10	10.92	134.02	11.00	0	0	-134.10	0
1978	4.65	161.13	120.85	98.48	22.37	148.31	11.00	0	0	-136.94	0
1979	4.71	189.82	142.37	113.14	29.23	143.31	11.00	0	0	-125.01	0
1980	4.59	237.93	178.45	140.17	38.28	167.40	13.00	0	0	-142.12	0

CASE 8 -- WHEAT PRODUCTION AND PROFIT FROM THE CONVERSION OF PLATTE RAPARIAN WETLANDS TO NON-IRRIGATED AGRICULTURAL USE

Year	1 Output/ Acre	2 Average Revenue/ Acre	3 Revenue Per Acre After Flooding Loss	4 Lost Hay Revenue Per Acre	5 Revenue Per Acre (Col. 3 - Col. 4)	6 Variable Cost Per Acre	7 Property Taxes Per Acre	8 Farmer's Amortized Conversion Cost Per Acre	9 Maintenance or Depreciation of Conversion System	10 Profit Per Acre Before Income Taxes	11 Government Amortized Conversion Cost Per Acre
1965	19.80	26.33	19.75	40.90	-21.15	22.50	3.67	0	0	-47.32	0
1966	34.18	56.78	42.59	43.13	-0.54	22.97	4.25	0	0	-27.76	0
1967	25.02	33.63	25.22	41.36	-16.14	23.45	4.83	0	0	-44.42	0
1968	30.89	36.34	27.26	43.80	-16.54	24.04	5.42	0	0	-46.00	0
1969	34.45	40.46	30.35	50.51	-20.16	24.53	6.00	0	0	-50.69	0
1970	39.69	49.09	36.82	47.07	-10.25	25.22	6.58	0	0	-42.05	0
1971	42.06	53.53	40.15	57.71	-17.56	26.42	7.17	0	0	-51.15	0
1972	35.57	63.35	47.52	71.97	-24.45	27.07	7.75	0	0	-59.27	0
1973	40.93	155.54	116.66	93.64	23.02	30.06	8.33	0	0	-15.37	0
1974	35.08	135.02	101.27	101.07	0.20	36.90	8.92	0	0	-45.62	0
1975	24.62	86.01	64.51	121.33	-56.81	44.96	9.50	0	0	-111.27	0
1976	27.24	67.58	50.69	116.62	-65.93	43.37	9.00	0	0	-118.30	0
1977	38.68	87.47	65.60	92.10	-26.10	39.24	11.00	0	0	-76.34	0
1978	31.23	90.48	67.86	98.48	-30.62	34.08	11.00	0	0	-75.70	0
1979	34.44	130.14	97.61	113.14	-15.53	37.33	11.00	0	0	-63.88	0
1980	42.92	162.91	122.18	140.17	-17.99	37.91	13.00	0	0	-68.90	0

Cost/acre	Case 9 ($4,000 land shaping cost)	Case 10 ($15,000 land shaping cost)	Case 11 ($26,000 land shaping cost)
Total Cash Cost	$186.38	$186.38	$186.38
Labor	12.42	12.42	12.42
Property Taxes	3.24	3.24	3.24
Fixed Machinery and Leveling Cost (Interest, Depreciation and Insurance)	104.81	120.53	137.30
Overhead and Mgt.	NA	NA	NA
Total	$306.85	$322.57	$339.34
Revenue/Acre@ $2.80/BU			
@ 75 BU/acre	210.00	210.00	210.00
@ 100 BU/acre	280.00	280.00	280.00
@ 130 BU/acre	364.00	364.00	364.00
Before Tax Profit			
A. 75 BU/acre	-96.85	-112.57	-129.34
B. 100 BU/acre	-26.85	-42.57	-59.34
C. 130 BU/acre	57.15	41.43	24.66

Cost Per Acre	Case 12 ($4,000 land shaping cost)	Case 13 ($15,000 land shaping cost)	Case 14 ($26,000 land shaping cost)
Cash Cost(From Above)	$306.85	$322.57	$339.34
Land Cost/acre	20.50	20.50	20.50
Overhead	10.02	10.02	10.02
Management	13.00	13.00	13.00
Total	$350.37	$366.09	$382.34
Before Tax Profit			
A. @ 75 BU/acre	-140.37	-156.09	-172.34
B. @ 100 BU/acre	-70.37	-86.09	-102.34
C. @ 130 BU/acre	13.63	-2.09	-18.34

PROPERTY TAXATION OF WETLANDS IN NEBRASKA

In Nebraska, it is sometimes asserted by farmers that they pay property taxes on their land whether they receive anything from it or not. Thus, in the case of nonproductive wetlands, if taxes are still being paid, farmers may feel these areas have to be put into agricultural production. In evaluating this proposition, a general analysis of property taxation in Nebraska was conducted in the course of the study.

Wetlands in Nebraska can be taxed according to their agricultural, commercial, or recreational value. For land in the last two categories, taxes are assigned as they would be for any commercial or recreational venture: based upon the profitability of the venture. This discussion primarily concerns the agricultural use of wetlands for which the taxation procedures are more complicated.

Agricultural Taxation Procedures

Property taxation of agricultural lands in Nebraska is based upon the expected income from the "highest and best use" of the land. In practice the "highest and best use" is generally considered to be the current use. The land value using this "income approach" is computed for each land type in each county of Nebraska.

Different land types in Nebraska are categorized in four principal Land Valuation Groups (LVGs): irrigated cropland (A); dry cropland (D); rangeland and meadow (R); pasture (P); and wasteland (W). The first two LVGs are self-explanatory; the rangeland and meadow LVG includes native grasses used for grazing or hay; the pasture LVG includes permanent bromegrass or introduced grasses used for grazing or hay; and the wasteland LVG includes all land which has no present economical use.

Within these principal LVGs, four divisions are made according to the expected yields of the land for grain or forage crops: (1) high to very high yields; (2) moderately high to above average yields; (3) average to moderately low yields; and (4) low to very low yields. Multiplied by the first four principal LVG's, these four subdivisions produce a total of sixteen LVGs plus wasteland as a separate LVG. For example, dry cropland with a moderately high yield would be classified as LVG 2D.

The subdividing of land types can go even further as needed. If there are significant yield differentials within an LVG, a number can be added to the LVG classification (e.g., LVG 2D1) to differentiate between higher and lower yields. A letter may also be added to the LVG classification to indicate special characteristics of the land, such as "S" for sandy soils and "H" for hardland soils.

The seventeen LVGs, plus any subdivisions which are made, are used to classify agricultural land in every county. In addition to county-by-county classification, land is also classified as being in one of seven Land Manual Areas (LMAs) in Nebraska, which are referred to when similarities among counties make a higher level of aggregation desirable. (A map of the LMAs is provided at the end of this discussion.) Land values for a particular LVG will vary among counties and LMAs according to the expected income from the land. Once the LVG values are set for each county, county assessors determine the number of acres in each section which fall into each LVG, and every acre is assigned the proper value for taxation purposes.

Wetland Classifications

Wetlands in Nebraska can fall into one of two LVGs: wasteland (W), and 3R1 (rangeland with average to moderately low yields). County assessors rely upon a determination by the Soil Conservation Service that a wetland is either a marsh (wasteland) or pasture (3R1).

The Department of Revenue description of a wasteland, from the Nebraska Agricultural Land Valuation Manual, is the following:

> This indicates all miscellaneous land types, that cannot be used economically or are not suitable for any agricultural use and production in their present condition. Typical wasteland areas are blowouts, riverwash (recent unstabilized alluvial deposits), marshes, badlands, large deep gullies, bluffs, rockland, gravel areas, salt flats, and intermittent lakes or frequently ponded areas. Some of these types of areas could be developed or reclaimed for some beneficial use by land shaping, revegetation, drainage, or possibly other special practices. Until such land types are reclaimed, developed, or restored to agricultural production they will be classified as wasteland.

The description of LVG 3R1 is as follows:

> This 3R1 group includes mainly lowland soils on which forage production is above average. Included are four kinds of soils. The principal soils in this LVG are those that are subject to stream overflow, or receive run-in water, both of which supply beneficial moisture for plant growth. Another group are those soils with a deep water table at a depth of

about five or six feet. This depth to water is within the root zone of many grasses and favorably influences the growth of vegetation. The third group includes those soils with a water table that ranges from above the surface to a two foot depth below the surface during different seasons of the year. Plant growth is abundant, however, much of the time grazing is limited and haying is not possible due to wetness. Some of the plant species are less desirable on these wetland areas than on the other kinds of soils in this LVG. A fourth type of land or kinds of soils in this LVG are mixed or complex areas of 2R and 3R where the soils in these two range sites are so intermixed that they were mapped together as one unit.

Range Sites in LVG 3R1

Wetland (WL): This range site consists of the nearly level bottom lands, depression areas or low meadow areas that are wet to somewhat marshy. The water table is within a depth of two feet below the surface during much of the year and is above the surface during the early part of the growing season. Soils in this range site are suitable mainly for hay production in those years when it can be harvested. The forage is normally of lower quality than that on the better meadows. Some fall and winter grazing and feeding is common on many of these areas. Spring and early summer grazing is not always possible due to excessive wetness. Some areas are too wet to harvest for hay in some seasons.

Silty Overflow (SiO): Includes friable silty soils on overflowed bottom lands or other lowland areas that receive run-in water.

Clayey Overflow (CyO): Includes clay or clayey soils on overflowed bottom lands and some depressions in the upland.

Sandy Lowland (SyL): Includes moderately sandy and sandy soils on bottom lands and stream terraces that receive water from flooding or have a deep water table at a depth of about five to eight feet.

Silty Lowland (SiL): Includes silty soils on seldom flooded bottom lands, stream terraces, and foot slopes.

Saline Subirrigated (SS): Includes soils on bottom lands, stream terraces, foot slopes, and upland basins that have a water table at a depth of 10 to 60 inches during most of the growing season and are strongly saline or alkali in the upper part of the soil.

Saline Lowland (SL): Includes strongly saline and/or alkali soils that receive some overflow or have a deep water table.

Wetlands Valuation

The values of each LVG for each county are provided in the *Nebraska Agricultural Land Valuation Manual*. These values are determined, as noted, using the income approach (an example of which is provided after the LMA map). LVG W and 3R1 categories for each LMA are as follows:

LMA	LVG 3R1	LVG W
1	$70-85/acre	$10/acre
2	80-135	10
3	130-185	20
4	85-140	15
5	110-200	15
6	195-240	20
7	none	25

While LVG W, by definition, does not have an expected income, it has nonetheless been assigned a "nominal value" of $10-25 per acre.

These land values are mandatory for each LVG group since 1979. From 1974 to 1979 the State issued guidelines for each county to follow in assigning values to LVG groups, but these guidelines were not mandatory. Before 1974 there were no guidelines, and each county did its own estimation of land values for taxation purposes or hired firms to estimate land values. This method resulted in disparities among counties in assessed values for the same land types, resulting in pressure for state guidelines and eventually mandatory values for each LVG group.

Application of Valuation Procedures at the County Level

The county assessors of five Nebraska counties were contacted in order to determine how the valuation procedure for agricultural land is carried out at the county level.

The basis of the valuation procedure is the Soil Survey for each county prepared by the Soil Conservation Service. Two of the counties contacted were working off of Soil Surveys done in the last two years, while the other three counties had Soil Surveys in progress but are presently working off of Soil Surveys prepared in the late 1960s. The Soil Survey produces for each section of land an 8" by 8" map which contains lines dividing areas with different soil types with each soil type labeled. The soil classification is broad enough to include the moisture content of the soil and what kinds of foliage are supported by the soil.

Each county prepares a conversion table for converting the SCS symbols for soil types into the less-numerous LVG classifications. A clear overlay is set upon the Soil Survey map, the lines are traced over, and the land areas are reclassified. Where the soil type does not translate directly or unambiguously into an LVG group, the assessor's office relies upon aerial photos of the land taken by the Federal Agricultural Stabilization and Conservation Service every two years.

To determine the number of acres in each land area, the county assessors use either a "dot counter" or "planimeter." The dot counter is a clear plastic sheet with a grid of 10 dots per acre on the 8" by 8" map. The dot counter is placed over a particular land area on the clear overlay traced from the Soil Survey map, and the number of dots in that area is manually counted. The total is then divided by ten to determine the acreage in that area--for instance, 216 dots represents 21.6 acres. While four of the contacted counties use this method, one uses the planimeter. This is a small machine with an elbowed arm, one end of which clamps to the surface underneath the map, and the other end of which is used to "trace" the perimeter of a particular land area and internally calculate the area inside that perimeter. The tracing is done manually.

Once the acreages of the LVG groups within a section have been computed, the totaled acreage may be "justified" to ensure that it comes out to 640 acres. Some adjustment may also take place when the acreage computed in this way for each farmer does not correspond to the farmer's actual acreage.

In this way the acreage in each LVG group for each section of land in the county is computed and recorded on tables to be assigned a value as described in previous sections. No one from the assessor's office goes out and actually looks at the land unless a change has been reported, usually by the farmer. Field research may also be undertaken if there is some other indication that land use may have changed, such as an increase in the number of wells on the "Well List" for each county, perhaps signaling an increase in irrigated land. None of the assessors' offices reported that they do any routine or other checking on land use without some indication that land use has changed.

Each of the assessors was asked whether there had been any special concerns raised about wetland valuations by farmers, and each response was negative. One potentially important fact was noted by one assessor on a personal visit, and this is that there is a fair amount of individual discretion in translating land uses from the Soil Surveys and aerial photos into LVG groups. She displayed an example of a classified section and noted two areas obviously covered by water. One was smaller than the other and covered about an acre and was classified as "pasture" along with the surrounding land which was not wet. Her justification for this was that the wet land, while it does not produce direct benefits for a farmer, still benefits the surrounding pasture by helping to drain it. The larger wetland in the photo was also classified in the same way as the land around it, although she said in that instance that her personal judgment would have been to classify it separately, as wasteland or 3R1, because of its size.

This illustrates two points: 1) there is some individual discretion in classifying land uses over which there may be reasonable debate; and 2) small wetlands may not be classified separately from the land around them. The dynamic characteristics of wetland areas and the variability in the degree to which they can be used agriculturally may present many problems in properly assessing their value for taxation purposes.

Using the property taxation guidelines just enumerated, the following assessed values for various types of land and associated uses were estimated along with the annual tax payments at an assumed rate of one percent. The first example is for a typical wet-meadow area in the Sandhills. The initial estimates shown reflect its assessed value if used for hay production. The second set are estimates if converted to irrigated corn production. The final estimates indicate what marshland classified as "wasteland" would be assessed.

The second set of estimates are for the Central Platte Valley. Values for a wet-meadow area left in native grasses and used for hay production are first shown. Values if converted to irrigated corn production under assumption of both "high yields" and "low yields" are next shown.

Finally, the third set show values for Rainwater Basin wetland areas classified as marsh (wastelands) and lands used for irrigated

ESTIMATED ASSESSED VALUES AND TAX PAYMENTS FOR DIFFERENT WETLANDS AND USES

	Assessed Value	Taxes at 1% Rate
Sandhills Wet Meadow (LMA 2)		
hay production (3R1)	$100-135/acre	$1.10-$1.35
irrigated corn production		
high yield (1A)	$845-930/acre	$8.45-$9.30
below ave. (3A)	$430-470/acre	$4.30-$4.70
marsh (wasteland)	$10/acre	$ .10
Central Platte Valley Wet Meadow (LMA 5)		
hay production (3R1)	$160-195/acre	$1.60-$1.95
irrigated corn production		
high yield (1A)	$1070/acre	$10.70
below ave. (3A)	$580/acre	$5.80
Rainwater Basin Wetland (LMA 6)		
marsh (W)	$20/acre	$ .20
irrigated corn production		
high yield (1A)	$1070/acre	$10.70
below ave. (3A)	$580/acre	$5.80

corn production (for both high yield and low yield categories).

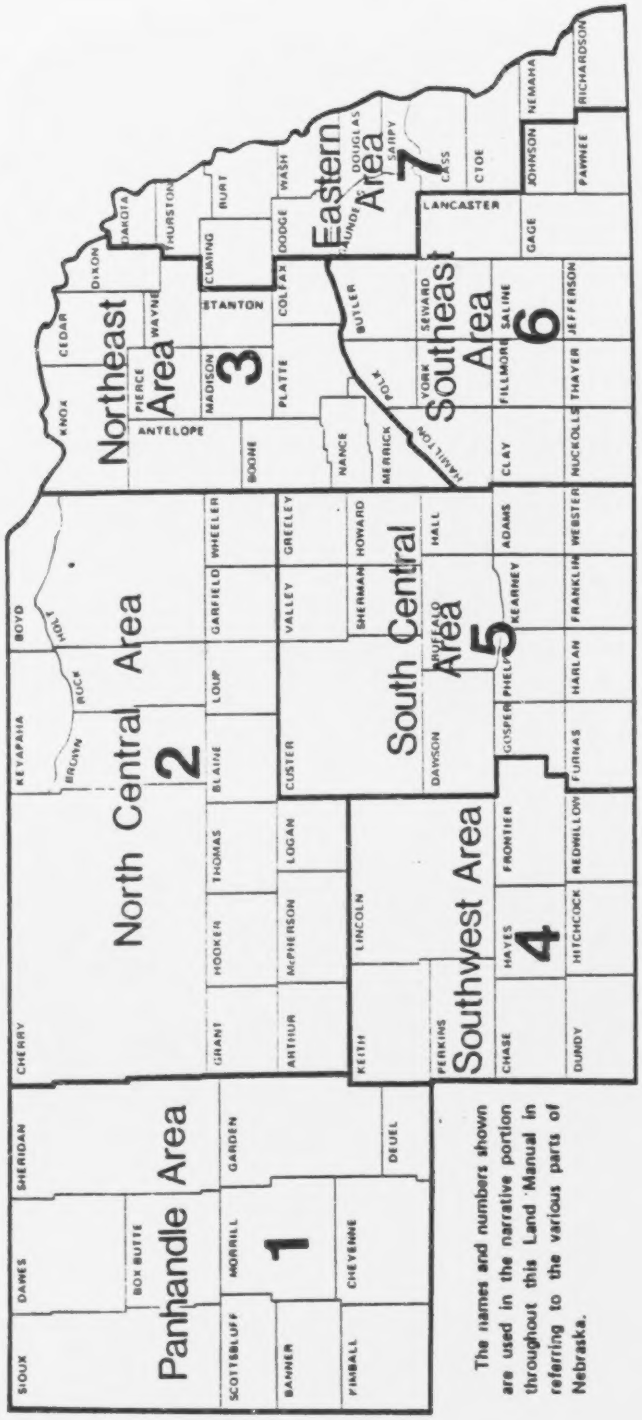
Although landowners still pay property taxes on wetland areas even if they receive no production from them, these taxes are nominal. Taxes on marshland with no production in the Sandhills amount to around 10 cents per acre per year.

Wet meadows used for hay production in the Sandhills are taxed at a little over a dollar per acre per year. If placed under irrigated corn production and reassessed accordingly, these taxes would increase anywhere from four to nine times. A similar situation occurs when Platte River wet meadows are likewise converted.

In the Rainwater Basin, taxes on wetland areas left as marshes where the farmer does not attempt to farm them may be as low as 20 cents per year. If drained or otherwise converted for irrigated corn production, taxes increase substantially (as much as ten dollars per acre per year).

In light of these findings, the existing property taxation system in Nebraska should not be an inducement to farmers to convert wetlands to more intensive agricultural use.

Land Manual Areas


Panhandle Area
1
North Central Area
2
Northeast Area
3
Southwest Area
4
South Central Area
5
Southeast Area
6
Eastern Area
7
SIOUX
DAWES
BOX BUTTE
SHERIDAN
SCOTTSBLUFF
MORRILL
GARDEN
BANNER
KIMBALL
CHEYENNE
DEUEL
CHERRY
KEYAPAHA
BROWN
ROCK
BOYD
HOLT
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
ARTHUR
McPHERSON
LOGAN
CUSTER
VALLEY
GREELEY
KEITH
LINCOLN
PERKINS
CHASE
HAYES
FRONTIER
DUNDY
HITCHCOCK
REDWILLOW
DAWSON
GOSPER
FURNAS
PHELPS
HARLAN
BUFFALO
KEARNEY
FRANKLIN
SHERMAN
HOWARD
HALL
ADAMS
WEBSTER
KNOX
CEDAR
DIXON
DAKOTA
THURSTON
PIERCE
WAYNE
ANTELOPE
MADISON
STANTON
CUMING
BURT
BOONE
PLATTE
COLFAX
DODGE
WASH
NANCE
MERRICK
POLK
BUTLER
SAUNDERS
DOUGLAS
SARPY
HAMILTON
YORK
SEWARD
LANCASTER
CASS
OTOE
CLAY
FILLMORE
SALINE
GAGE
JOHNSON
NEMAHA
NUCKOLLS
THAYER
JEFFERSON
PAWNEE
RICHARDSON

The names and numbers shown are used in the narrative portion throughout this Land Manual in referring to the various parts of Nebraska.

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Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 5

Rangeland Values

VALUES FOR LMA 1

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage Per Acre	.9	.8	.5	.4	.3	.2
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$10.80	$9.60	$6.00	$4.80	$3.60	$2.40
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60.
Landowners Income Except for Taxes	$9.80	$8.60	$5.20	$4.00	$3.00	$1.80
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$196.00	$172.00	$104.00	$80.00	$60.00	$36.00

How to Use Table

Calculate each column as follows. Use 1R as example, .9 AUM x $12 per AUM grazing fee gives income of $10.80/acre, subtract $1.00 expenses giving landowner income of $9.80/acre, divide $9.80 by 5% rent-to-value ratio for grassland, gives the indicated land value of $196 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 1.

VALUES FOR LMA 2

Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.0	.9	7	.5	.4	.3
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$12.00	$10.80	$8.40	$6.00	$4.80	$3.60
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60
Landowners Income Except for Taxes	$11.00	$9.80	$7.60	$5.20	$4.20	$3.00
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$220.00	$196.00	$152.00	$104.00	$84.00	$60.00

How to Use Table

Calculate each column as follows: Use 1R as example, 1.0 AUM x $12 per AUM grazing fee gives income of $12.00/acre, subtract $1.00 expenses giving landowner income of $11.00/acre, divide $11.00 by 5% rent-to-value ratio for grassland, gives the indicated land value of $220 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 2.

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Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 59

VALUES FOR LMA 3
Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Rental Share Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.2	1.0	.8	.7	.55	.4
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$14.40	$12.00	$9.60	$8.40	$6.60	$4.80
Landowners Expense per Acre	$1.00	$1.00	$.80	$.80	$.60	$.60
Landowners Income Except for Taxes	$13.40	$11.00	$8.80	$7.60	$6.00	$4.20
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$268.00	$220.00	$176.00	$152.00	$120.00	$84.00

How to Use Table

Calculate each column as follows: Use 1R as example. 1.2 AUM x $12 per AUM grazing fee gives income of $14.40/acre, subtract $1.00 expenses giving landowner income of $13.40/acre, divide $13.40 by 5% rent-to-value ratio for grassland, gives the indicated land value of $268 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 3.

VALUES FOR LMA 4
Example of Income Approach to Indicated Rangeland Values

Factors Used to Determine Landowners Rental Share Income Per Acre	Read All Calculations Vertically for Each Range LVG Shown at the Top of Each Column					
Land Valuation Group	1R	2R	3R1	3R	4R1	4R
Animal Unit Months Forage per Acre	1.05	.9	.75	.55	.4	.3
Grazing Fee per AUM	$12.00	$12.00	$12.00	$12.00	$12.00	$12.00
Landowners Total Income per Acre	$12.60	$10.80	$9.00	$6.60	$4.80	$3.60
Landowners Expense per Acre	$1.00	$1.00	$.80	$.70	$.60	$.60
Landowners Income Except for Taxes	$11.60	$9.80	$8.20	$5.90	$4.20	$3.00
Rent-to-Value Ratio in Percent	5%	5%	5%	5%	5%	5%
Indicated Land Value per Acre	$232.00	$196.00	$164.00	$118.00	$84.00	$60.00

How to Use Table

Calculate each column as follows: Use 1R as example, 1.05 AUM x $12 per AUM grazing fee gives income of $12.60/acre, subtract $1.00 expenses giving landowner income of $11.60/acre, divide $11.60 by 5% rent-to-value ratio for grassland, gives the indicated land value of $232 for 1R LVG. The indicated land values above were the type of benchmark values used in the gradation of Rangeland Values in LMA 4.

Source: Nebraska Agricultural Land Valuation Manual, State Department of Revenue, Lincoln, Nebraska, 1980, p. 60

LEGAL CONSIDERATIONS REGARDING WETLANDS IN NEBRASKA

Nebraska Drainage Law (J. David Aiken)

Nebraska statutes and court decisions traditionally have given landowners wide discretion in draining wetlands. Natural resources districts (NRDs) have broad drainage authorities and state funds are available to drain wetlands. While more recently enacted environmental quality statutes authorize the State Department of Environmental Control (DEC) to regulate drainage activities, these haven't been used.

Drainage of diffused surface waters is one of the most heavily litigated areas of Nebraska water law [Yeutter, Diffused Surface Water Law in Nebraska, 41 Neb. L. Rev. 765, 1962; Thorson, Drainage of Diffused Surface Waters (St. Water Planning and Rev. Process Task Force Report to the Neb. Nat. Res. Comm., Nov. 1981)].

In its most recent drainage decision, the Nebraska Supreme Court defined "diffused surface water" as "waters which appear upon the surface of the ground in a diffused state, with no permanent source of supply or regular course, which ordinarily result from rainfall or melting snow " (Sullivan v. Hoffman, 207 Neb. 166, 172, 296 N.W. 2d 707, 711, 1980). Wetlands fall within this definition whether they are riparian wetlands, rainwater wetlands, or wetlands resulting from high water tables.

Landowners generally have the right to drain their land of unwanted diffused surface water, i.e., to drain their wetlands (Neb. Rev. Stat. sec. 31-201, 1978; Nichol v. Yokum, 173 Neb. 298, 263 N.W. 2d 437, 1962). A landowner has the right to drain his land even if the diffused surface water collects in natural or temporary basins "in the interest of good husbandry " (Nickman v. Kirschner, 202 Neb. 78, 82, 273 N.W. 2d 675, 678, 1979).

State statutes provide modest wetland protection regarding lake drainage. Lakes with a surface area of at least 20 acres at low water stage cannot be drained without a permit from the Nebraska Department of Water Resources if the lake is economically more valuable for fish culture or hunting than the lake bed would be for agriculture (Neb. Rev. Stat. Sec. 46-801, 1978). Smaller lakes are not subject to this permit requirement and presumably may be drained at will by landowners.

The major issue in Nebraska drainage law traditionally has been not whether landowners could drain unwanted diffused surface water, but whether they were liable for increasing the flow of diffused surface water onto lower landowners.

Owners of agricultural land may also dike their land to prevent unwanted diffused surface water from draining onto their land so long as it is in a purely diffused state and does not flow in a regular course (Nichol, supra.). However, the Nebraska Supreme Court in Nichol enunciated the "little watercourse rule" which says that if diffused surface water is collected in natural drainways and flows in a regular course, the water cannot be obstructed through dams or dikes.

In addition, Nebraska statutes authorize a large number of drainage authorities (Thorson, supra. at 1-9 to 1-11). However, the most significant modern drainage authorities have been given to natural resources districts. NRDs are given broad drainage authorities and taxing authorities to implement drainage projects (Neb. Rev. Stat. Sec. 2-3201, -3229, -3242, 1977 and Supp. 1980). Drainage projects can be financed through general NRD mill levy authority and in "project improvement areas" by additional levies against drained land (Neb. Rev. Stat. Sec. 2-3252 et seq., 1977). Drainage projects may also be funded through the Nebraska Resources Development Fund (Neb. Rev. Stat. Sec. 37-216.01 et seq., 1977).

Wetland Legal Protections

Nebraska water allocation statutes provide no direct protection for wetlands or subirrigation, except for the lake drainage permit requirement described previously. The Nebraska Supreme Court has ruled, however, that a landowner is entitled to compensation when his subirrigated land is drained by a canal [Luschinger v. Loup River Pub. Power Dist., 140 Neb. 179, 200 N.W. 549 (1941); see Aiken, Nebraska Ground Water Law and Administration, 59 Neb. L. Rev. 917, 947-48 (1980)].

As discussed earlier, Nebraska Supreme Court drainage decisions generally permit drainage of wetlands, but may require an upper landowner to pay money damages to a lower landowner damaged from drainage activities. It is unclear, however, whether a landowner would be entitled to compensation for wetland drainage or subirrigation drainage caused by irrigation well withdrawals. In most situations the surface and groundwater uses both would be for agricultural purposes and thus would enjoy the same preference status under Nebraska law. If the wetland use were not for agricultural purposes, it probably would not be legally favored because the Nebraska constitution affords a special preference to irrigation uses over all other non-domestic water uses (Neb. Const. art. XV, § 4. See Aiken, supra at 996-97). Thus Nebraska statutory law and common law does not provide much protection for preservation of wetlands and subirrigation.

An unsuccessful 1982 legislative proposal, LB 726, (introduced by Sen. Tom Vickers of Farnam) would have authorized natural resources districts (NRDs) to regulate groundwater withdrawals to protect surface water uses (presumably including wetlands) and subirrigation in groundwater control areas. Under existing law a groundwater control area may be designated by the Nebraska Department of Water Resources (DWR) at the request of an NRD to deal with groundwater depletion or groundwater pollution (Neb. Rev. Stat. § 46-658). LB 726 would have authorized control area designation if groundwater withdrawals threaten subirrigation or surface water uses within an NRD. If a control area were designated, the NRD could have been authorized to regulate groundwater development and use with DWR approval to prevent interference with subirrigation or surface water uses.

Subirrigation is often the result of a "full" groundwater aquifer. Thus, groundwater control area regulations designed to preserve subirrigation could have a considerable impact on irrigation development. Theoretically, extensive use of available groundwater supplies could be prevented to maintain a full groundwater aquifer. Because LB 726 could have dramatically slowed irrigation development in the Nebraska Sandhills region, it was successfully opposed by irrigation development interests in the 1982 Legislature. Senator Vickers has indicated, however, that he intends to introduce a similar proposal in 1983 if he is reelected to the Unicameral.

Interbasin Water Transfers and Wetlands Protection

In 1980, the Nebraska Supreme Court reversed a 44-year ban on interbasin surface water transfers in Nebraska. This has led to a race among irrigation development interests to acquire Platte River water rights for in-basin and out-of-basin irrigation uses. Interbasin transfer appropriations must be reviewed by the Nebraska Department of Water Resources (DWR) to see whether, considering both environmental and economic criteria, the state as a whole would be better off with the proposed project than without it. Also, all appropriations must be reviewed pursuant to the Nebraska Endangered Species Act to determine whether the proposed activity will interfere with the continued existence of endangered or threatened species or their habitat. If the proposed activity may interfere with such species or their habitat, the activity cannot be undertaken. While several Platte River irrigation proposals are pending, their ultimate implementation may hinge upon a greatly expanded state water development funding program.

The ban on transbasin diversions was based on the 1936 Nebraska Supreme Court decision of Osterman v. Central Neb. Pub. Power & Irr. Dist. (131 Neb. 356, 268 N.W. 334 (1936)). The Osterman prohibition of interbasin transfers protected wetlands to some extent in the Platte basin by preventing the development of irrigation projects which would have further reduced Platte River flows. Osterman was overruled in Little Blue NRD v. Lower Platte North NRD. (206 Neb. 535, 294 N.W. 2d 598 (1980)). In Little Blue, the Nebraska Supreme Court ruled that transbasin diversions of surface water were legal if the DWR director determined that such diversions were in the public interest.

Seven major irrigation projects have been proposed and project sponsors are competing furiously for Platte River water rights. Two Nebraska Supreme Court battles have been fought and at least one more is likely in the next two years. If any of these projects are developed, a significant impact on riparian wetlands may occur. Such an impact will need to be considered in making water-rights decisions regarding interbasin transfers, however.

In response to Little Blue, the 1981 Nebraska Unicameral defined the factors the DWR director is required to consider in making the public interest determination. If the state as a whole were better off without the diversion, considering both the economic and environmental impacts of the diversion, the appropriation would be denied. If the state would be better off with the diversion, the appropriation would be granted (Neb. Rev. Stat. § 46-289 (Supp. 1981)). This means that those opposing a particular project may participate in the hearing before the DWR, point out any wetland losses that may result from project implementation, and argue that the state is better off without the project than with it.

Nebraska Endangered Species Act

The DWR director will also have to evaluate the impact of the proposed irrigation project on the habitat of endangered or threatened wildlife species. On March 19, 1982, the Nebraska Supreme Court ruled that Neb. Rev. Stat. § 37-435(3), a provision of the Nebraska Endangered Species Act, requires the DWR director to consult with the Nebraska Game and Parks Commission (NGPC) to determine whether proposed surface water appropriations would interfere with the existence of threatened or endangered wildlife species or their habitat (*Little Blue NRD v. Lower Platte North NRD*, 210 Neb. 862, 317 N.W. 2d 726 (1982)). The court also ruled that the consultation requirement extended to political subdivisions of the state, such as NRDs, irrigation districts, etc.

The Endangered Species Act may directly or indirectly protect riparian wetlands in the Platte River basin. A large portion of the central Platte River area, including riparian wetlands, has been designated by the U.S. Fish and Wildlife Service as being critical habitat for the endangered whooping crane (50 C.F.R. § 17.11 (1980)). Wildlife proponents are likely to argue strongly that the proposed irrigation projects would adversely affect this critical habitat. If the NGPC concludes after consultation that a proposed irrigation project would not adversely affect endangered species or their habitat, the project would be approved by the DWR if it met the § 46-289 public interest requirements. If the NGPC concluded, however, that the irrigation project would adversely affect endangered species or their habitat, the project sponsor could modify the proposed irrigation project to avoid interfering with endangered species or their habitat, if this were possible or feasible. If the NGPC determined that the modified project still adversely affected the endangered or threatened species or their habitat, the DWR director as a practical matter would have to deny the irrigation project's application. It seems unlikely that the DWR director would rule that the project would not threaten endangered species after an NGPC determination that it would.

State Irrigation Development Financing

While the public interest review for interbasin transfer appropriations and the habitat review pursuant to the Nebraska Endangered Species Act may protect riparian wetlands in the Platte River basin regarding potential irrigation project development, these provisions do not guarantee wetland preservation. However, even if water rights are issued for these Platte River irrigation projects, financing must be obtained if the projects are to be implemented. This may be the biggest hurdle to irrigation project proponents.

Nebraska water laws have traditionally encouraged surface water development. Current statutes authorize organizing a variety of special purpose districts with broad financial and related authorities to develop major surface water reservoirs. In the past, these water projects have been financed principally by the federal government. Recently, however, federal officials have suggested that states and water users should bear a greater share of water project costs. To date, the Nebraska Unicameral has not made a state financial commitment to water development sufficient to offset loss of federal funds, although the Legislature has given bonding authority to a variety of districts for water development purposes.

Interest in surface water development has increased dramatically in Nebraska during the past two years and the competition for Platte River water rights and the associated water projects has led to concern regarding how these projects would be financed. LB 577 is a proposed constitutional amendment coming before Nebraska voters in November, 1982, which would allow the Nebraska Unicameral to authorize state revenue bonds for surface water projects. The Nebraska Constitution authorizes issuance of state revenue bonds for highways only. However, LB 577 may not provide a significant means for state financial support of surface water development because it is tied to the repayment capacity of water users. Traditionally, water users' charges have provided sufficient revenue for operation and maintenance of a water project only, with little or nothing being available for construction cost repayment.

Although voter approval of LB 577 may not provide adequate state financing of water projects, it could have a significant impact on how receptive the Legislature is to other water project financing proposals. Two unsuccessful 1982 legislative proposals would have earmarked one-half a percent and one percent of the state sales tax, respectively for water development purposes. This would generate approximately $40 million and $80 million annually. If federal matching funds were available, as seems likely, this would represent an aggressive state financial commitment to surface water development.

If LB 577 receives strong voter approval this November, water development advocates will press for legislation similar to these proposals. If the vote on LB 577 is close, or if it is defeated, water development advocates will be more cautious in promoting legislation establishing state financial support for water development. The decisions made regarding the financing of water development projects could have a greater impact on wetland preservation than could the Endangered Species Act or the public interest review required for interbasin transfer appropriations.

Nebraska Environmental Protection Act

The DEC has broad statutory authority to establish regulatory programs to protect wetlands pursuant to the Nebraska Environment Protection Act (NEPA) (Neb. Rev. Stat. Sec. 81-1501 et seq., 1978). NEPA establishes that:

> It shall be unlawful for any person:
>
> (a) To cause pollution of any air, waters, or land of the state or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any air, waters, or land of the state; or
>
> (b) To discharge or emit any wastes into any air, waters, or land of the state which reduce the quality of such air, waters, or land below the air, water, or land quality standards established therefore by the Nebraska Environmental Control Council.

(Neb. Rev. Stat. Sec. 81-1506(1), 1980 Supp.)

These provisions apply to wetlands. "Waters of the state" are defined as:

> all waters within the jurisdiction of Nebraska, including all streams, *lakes*, ponds, impounding reservoirs, *marshes*, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and *all other bodies or accumulations of water, surface* or underground, natural or artificial, public or private, situated wholly or partly within or bordering the state.
>
> (Neb. Rev. Stat. Sec. 81-1502(21), 1980 Supp., emphasis added)

Wetland alteration or drainage are included in the section 81-1506(1)(a) pollution prohibition. "Water pollution" is defined as: "the manmade or man-induced alteration of the chemical, physical, biological, and radiological integrity of water " (Nebr. Rev. Stat. Sec. 81-1502(20)). This broad definition of pollution would include any human activity affecting wetlands, including wetland drainage due to lowering the groundwater table.

"Wastes" are defined as: "sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the state " (Neb. Rev. Stat. Sec. 81-1502(14)). This broad definition of pollution means that filling of wetlands would be within the waste discharge prohibition of section 81-1506(1)(b) if wetlands are covered in the surface water quality standards established by the Nebraska Environmental Control Council (ECC).

NEPA authorizes the DEC director to issue permits to prevent, control, or abate pollution or the discharge of wastes into the waters of the state (Neb. Rev. Stat. Sec. 81-1504(11)). This provision authorizes DEC to establish a permit requirement for draining or otherwise altering wetlands. Any DEC permit program, however, must be conducted consistently with the standards, rules and regulations adopted by the ECC (Neb. Stat. Sec. 81-1504(11)). This provision requires that the ECC approve any DEC wetland protection permit program.

Other Possible Wetland Protections

As indicated, landowners generally are free to drain wetlands in converting wetlands to cropland, subject only to the federal § 404 permit requirement. State law does not directly protect wetlands, except through the lake drainage permit requirement discussed earlier. DEC could regulate wetland drainage to protect water quality for a variety of purposes, including fish and wildlife maintenance if the proper regulations were adopted.

Other possible methods under existing state law for directly and indirectly protecting wetlands include: (1) wetland acquisition programs, (2) wildlife habitat set-aside programs, (3) conservation and preservation easement acquisition, (4) water supply augmentation, (5) groundwater quality control areas, and (6) land use regulations.

The Nebraska Game and Parks Commission is authorized to acquire wildlife habitat under a variety of programs. This activity is limited by available funding. An indirect political limitation is that land acquisition pursuant to the Habitat Stamp program must be reviewed by the Appropriations Committee of the Nebraska Legislature. (This program and others are discussed later in this report.)

Natural resources districts (NRDs) are also authorized to acquire land for wildlife purposes. NRDs' primary political constituency is farmers, however, some of whom oppose public acquisition and preservation of wetlands. NRDs are more likely to engage in programs threatening wetlands, such as drainage and water impoundments projects, than they are to acquire wetlands. (Note, however, that water impoundment projects may create wetland areas in many circumstances although varying in qualitative features and viability as habitat.)

The NGPC is authorized to provide financial incentives to landowners to take land out of agricultural production for wildlife management purposes. Most (but not all) NRDs cooperate with the NGPC in helping administer and provide local funding for this program. The program is limited by available funding. Some landowners argue that the financial incentives are not sufficient to persuade landowners to participate in the habitat program.

Wetland owners could donate or sell their development rights as "conservation and preservation easements" to the NGPC (Neb. Rev. Stat.

§ 76-2, 111 et seq. (1981 Supp.)). This approach hasn't been used but would compensate the landowner for any economic value foregone through wetland preservation, and would legally establish that wetlands be maintained (so long as they are not interfered with by third parties, e.g. drained by a neighbor's irrigation well). The NGPC could also solicit the donation of development rights or purchase development rights through its land acquisition programs.

If publicly owned wetlands are drained from nearby irrigation wells, the wetlands could be maintained by pumping groundwater or surface water into the wetlands. This is currently being done by the U.S. Fish and Wildlife Service in the Rainwater Basin. The only limitation on this approach is that permits for wells supplying water for wildlife maintenance cannot be obtained in groundwater control areas.

Irrigation development in the Sandhills region may be slowed or stopped through groundwater quality control areas. Under Neb. Rev. State. § 46-658, a control area may be designated if the director of the Nebraska Department of Water Resources determines that groundwater development (i.e. water well installation) or use has caused or is likely to cause in the reasonably foreseeable future groundwater quality degradation making the groundwater unfit for current uses.

Irrigation of sandy soils inevitably leads to increasing concentrations of water-soluble agricultural chemicals in the underlying groundwater aquifers. If a Sandhills NRD could present persuasive evidence to the DWR that intensive irrigation development would inevitably lead to goundwater quality degradation interfering with domestic and other water uses, the DWR director would practically be required to establish a control area. Once a control area were established, the NRD could establish groundwater regulations, including the prohibition of new irrigation wells to prevent groundwater quality degradation. In this manner, Sandhills irrigation development could be slowed or stopped. This, in turn, would reduce the interference of Sandhills irrigation development with wetland protection.

Sandhills irrigation development could be restricted through county and NRD land use regulations. Counties and NRDs are authorized to regulate rural land use including agricultural practices to achieve soil conservation objectives (Neb. Rev. Stat. § 2-3244 et seq., § 23-114 et seq.). Counties must first prepare and adopt comprehensive plans and then adopt a zoning ordinance. NRD-proposed land use regulations must receive 75 percent approval in a landowner referendum. In these regulations the NRD or county could identify what land is irrigable and what is unirrigable (based on soil types, slope, erosion potential, etc.) and prohibit or limit irrigation development on unsuitable soils. This approach could protect wetlands through preventing or limiting Sandhills irrigation development.

WETLAND PROGRAMS IN NEBRASKA

WETLAND PROTECTION PROGRAMS IN NEBRASKA

As previously discussed, Nebraska statutory and common law afford wetlands of the state little protection. However, several programs and regulatory measures are in effect in Nebraska which are designed to or are intended to protect or preserve wetlands. These include the Water Bank Program administered by the U. S. Agricultural Stabilization and Conservation Service (ASCS), wetland acquisition and easement programs through the U. S. Fish and Wildlife Service (FWS), and the Section 404 permit program administered by the U. S. Army Corps of Engineers (Omaha District Office), all federally-administered programs.

In addition, Nebraska has an NGPC-administered habitat program containing elements which permit wetland acquisition by the state, purchase of easements on wetlands, and contracting with landowners to set aside wetlands for non-use or limited use.

ASCS Water Bank Program

Under the Water Bank Act of 1973, USDA through ASCS is authorized to provide payments to private landowners who preserve wetlands on their land deemed important to migratory waterfowl. The program is intended for Types 3, 4 and 5 wetlands (shallow marshes, deep marshes and open water). Types 1 and 2 wetlands can also be included if they are adjacent to or nearby (within a quarter of a mile) these other wetland areas which are approved under the program. Adjacent upland acreage may also be included. In fact, SCS biologists like to have a mix of about 25 percent wetlands to 75 percent surrounding area.

At least two acres of Types 3, 4 or 5 wetlands must be a part of any individual tract with a minimum of 10 total acres. Contract periods run for 10 years and are renewable.

The rate of payment for acreage within a Type 3, 4 or 5 wetland is $10 per acre per year. Adjacent land within SCS land capability classes IV-VII receives $24 per acre. Land in capability class III receives $37 per acre and highly productive cropland in capability classes I and II receives $40 per acre annually.

Only five of the state's 93 counties were in the program through 1976. Ten counties were participating in 1981 and one county which formerly had participated had dropped out (York County). These counties and their Water Bank participation levels are shown in the table below.

WATER BANK PARTICIPATION LEVELS IN NEBRASKA THROUGH 1981

County	No. of Agreements	Total Program Acres	Ave. Acres per Agreement	Wetlands (acres)	Per Agreement	Adjacent Lands (ac)
Clay	12	571	47.6	220	18.3	351
Fillmore	16	1,034	64.6	447	27.9	587
Hamilton	1	78	78.0	21	21.0	57
Kearney	6	222	37.0	73	12.2	149
Keith	2	150	75.0	80.5	40.3	69.5
Lincoln	12	879	73.3	182	15.2	697
Logan	4	2,237	559.3	1,668	417.0	569
Nance	12	1,143	95.3	80	6.7	1,063
Phelps	17	926	54.5	281	16.5	645
York	1	16	16.0	4	4.0	12
Merrick	0	0	0.0	0	0.0	0
	83	7,256	87.4	3,056.5	36.8	4,199.5

Source: State ASCS Office

Over 3,000 acres of wetlands are currently protected under the program with an additional 4,000-acres-plus of adjacent lands. Water Bank acreage cannot be harvested, drained, burned, filled, clipped or "used in such a manner which would destroy its wetland character or value as a nesting or breeding area" (ASCS Handbook, 1-WBP, Part 2, 22). Once included in the program, cost-shares similar to those under the ACP program may be made available to the participating landowners to further develop the land consistent with the Water Bank program's objectives (such as creation of a wildlife food plot).

Six Rainwater Basin counties participate (or have participated) in the program (Clay, Fillmore, Hamilton, Kearney, Phelps and York). The total "wetland" acres from these counties included in the program is 1,046. Hamilton, Kearney and Phelps counties also have boundaries with the Platte River. Thus, along with Lincoln, Keith and Merrick counties, six counties with Platte River riparian wetlands also participate in the program.

The county with the greatest number of acres in the program is

Logan County in the west-central Sandhills region (including 1,668 wetland acres or over half of all Water Bank wetlands). It and Keith and Lincoln counties are the only participating counties from the entire Sandhills area. Nance County, which lies east of the Sandhills and north of the Platte River, is the last county in the program.

FWS Wetland Acquisition and Easements

Several pieces of federal legislation have made possible a national program for wetland acquisition and easement purchase. The Migratory Bird Conservation Act of 1929 authorized the purchase or lease of wetland areas of the nation and the Migratory Bird Hunting Stamp Act of 1934 established a one-dollar "duck stamp" for hunters of migratory birds to fund the purchase of refuge areas. 1958 amendments to the latter act established "Waterfowl Production Areas" (WPAs).

To speed the purchase of wetland and other habitat areas under these authorities, the Wetland Loan Act of 1961 was passed which provided interest-free loans for federal land purchasing including for WPAs. A loan amount of $105 million was initially authorized. Another $95 million was added in 1976 bringing the total to $200 million. To date, FWS has used approximately $145 million of this total throughout the Prairie Pothole Region including Nebraska (FWS correspondence, July 1982). Revenues from federal duck stamps have been used to supplement the loan fund as well. The current loan fund authorization is due to terminate the end of September, 1983.

While using easements in other states, the FWS currently only uses acquisition in Nebraska and this has only been used in the Rainwater Basin. Under both programs, lost taxes to counties and local subdivisions are replaced by "in lieu of tax payments" by FWS. To date, 14,657 acres of wetland basins and surrounding upland have been purchased in Nebraska (FWS correspondence, July 1982). About 56 percent of this is wetland acreage or around 8,200 acres. Most of this is concentrated in Clay, Kearney and Fillmore counties with large amounts also in Gosper, Franklin and Phelps counties.

Most of the acquisitions were made in the 1960s and early 1970s with an initial goal of acquiring 24,000 acres. A total of $3,311,106 was spent for the wetlands and upland or about $226 per acre (FWS correspondence, July 1982). Acquisition efforts are continuing on a priority basis within the Rainwater Basin until the program is terminated.

In purchasing wetlands, FWS employs a wetlands complex concept. Shallower-type marshes complement nearby more permanent marshes needed for waterfowl production. A standard of "20 percent wet" is used whereby a wetland base surrounded by uplands for nesting cover and winter cover are included in establishing most WPAs (FWS correspondence, July 1982).

Although FWS ten-year acquisition programs are usually complemented with easement purchasing, easements have never been employed in Nebraska. Easements-in-perpetuity are used and they generally have cost the FWS about half the costs of acquisition. A wetland easement program was contemplated several months ago by FWS for use in the Sandhills particularly in Rock and Holt counties in the east. However, according to FWS, budget limitations and lack of Sandhill's hydrology data put the program on hold. FWS and the U.S. Geological Survey are currently conducting hydrology studies on Sandhills lakes and marshes to provide additional information.

Public hearings on the proposed easement program revealed hesitancy on the part of farmers to "preserve wetlands in perpetuity" while the ranching community appeared more receptive (FWS correspondence, July 1982).

Regarding the success of WPAs in Nebraska, FWS personnel feel the program has been successful...not only in preserving wetlands but in providing nesting cover for migratory waterfowl and other species. "The main problem is funding, not only for acquisition but also to employ the needed staff to carry on the program" (FWS correspondence, July 1982). Staff at the Rainwater Basin Wetland Management District Office in Kearney principally manage FWS's Rainwater Basin wetlands.

In addition to these WPAs, there are three relatively large National Wildlife Refuges in the western Sandhills. Fort Niobrara with around 19,000 acres (very little wetland acreage), Valentine with around 71,000 acres (11,000 to 12,000 wetland acres and several lakes) and Crescent Lake with about 46,000 (4,900 acres of wetland marshes and about 1,200 acres of open freshwater lakes)(FWS, Pierre Area Office, telephone communication, August 1982, and FWS, Crescent Lake NWR, telephone communication, August 1982).

NGPC Wildlife Habitat Program

In 1976, Nebraska took a major step toward attempting to curb the increasing loss of wildlife habitat in the state including wetland areas with passage of LB 861. The measure created a state "Habitat Stamp" and increased state hunting permit fees. Proceeds from the $7.50 stamp are earmarked for a variety of habitat protection and enhancement measures and, along with permit fee increases, generate roughly $2.5 million annually.

Of this amount, $862,000 is allocated annually for private lands habitat development. The program is a cooperative program of the state NGPC and local NRDs (of which there are 24 in the state). NGPC pays 75 percent of the cost of several practices designed for habitat development with NRDs paying the remaining 25 percent with moneys derived from local property taxes.

The first practice is designed to establish permanent wildlife cover on marginal lands now being cropped. Landowners are contracted with for periods of 3 to 10 years (renewable contracts) to establish suitable covers for anywhere from 5 to 80 acres a year. A maximum of $35 per acre may be paid to participating landowners with an additional $25 per acre in the first year for soil preparation costs.

Another practice (Practice 3) is designed to encourage farmers to plant sweet clover with oats. The contract period is for two years and the payment rate is $30 per acre. Practice 4 is left open to NRDs to develop to meet special needs of their district (which in some cases has been used for wetland protection).

The last practice (Practice 2) is designed to protect wetlands (largely types III, IV and V) and other areas where grasses, legumes and/or woody vegetation already exist. Contract periods run for ten years and any single landowner may include anywhere from 3 to 40 acres and ordinarily receive $15 per acre annually. An additional $2.50 per acre is available under all practices if public access is permitted by landowners.

Currently, over 45,000 acres are in this private lands habitat program. This is somewhat short of the goal initially set for the program. Of this total, significant wetland areas represent only a portion and most of this is in the Rainwater Basin area. A NGPC field staffer (Bresley, Wildlife Habitat Area 2 Manager, Kearney) in the Rainwater Basin area estimates that around 350 acres of wetlands in 15 separate basins are included in the program. The NGPC field staffer also said that a special payment rate of $30 per acre for wetlands in the Rainwater Basin had recently been put into effect due to their importance.

Approximately $517,000 of the $2.5 million is allocated for management costs of existing NGPC wildlife areas and other public lands. The remaining money is targeted for wildlife lands acquisition ($776,000 annually) and habitat easements ($345,000 annually).

While easements have yet to be used, acquisition of habitat lands has proceeded. Purchases are on a willing-seller basis and condemnation authority is prohibited under the program. Lands are purchased at a fair market value and "in lieu of property taxes" payments are paid to local subdivisions.

A effort was made to determine which of the existing wildlife lands owned by the state (NGPC) include significant wetland areas and, of these, which are located in the three major wetland areas included in this study. It is important to note that several wildlife areas which have some riparian type wetland areas but that are located outside of the three wetland areas are excluded from the estimates. "Open water" areas such as lakes and streams are also not included in the wetland acreage estimates. The estimates primarily contain marsh areas and some wet meadow and riparian wetlands.

The table on the following page lists 22 state wildlife areas which contain significant wetlands (Edwards, NGPC, August 1982). The locations of these areas are also identified along with their total acreage and generally estimated wetland acreage. Over 8,000 acres of wetlands are included in these wildlife areas. Of these, approximately 2,370 acres are in the Rainbasin area, 600 acres in the central Platte Valley, and 1,165 acres are in the Sandhills.

NGPC's highest priority is wetlands in the Rainwater Basin and efforts continue to purchase more of these wetlands on a willing-seller basis. Offers by landowners of high quality wetland basins, however, are infrequent.

NEBRASKA GAME & PARKS COMMISSION WETLAND AREAS*

Name	Location	Total Acres	Wetland Acres
American Game Marsh	(Brown Co., N.E. Sandhills)	161	120
Ballards Marsh	(Cherry Co., N. Sandhills)	1562	1000
Bazile Creek (leased)	(Knox Co., on Niobrara River)	5665	3900
Cattail	(Hall Co., Central Platte Valley)	74	74
Rat & Beaver Lake	(Cherry Co., N. Sandhills lakes)	243	5
Sacramento-Wilcox	(Phelps Co., Rainbasin)	2320	1100
Smartweed Marsh	(Nuckolls Co., Rainbasin)	80	70
Southeast Sacramento	(Harlan Co., Rainbasin)	185	150
South Sacramento	(Harlan Co., Rainbasin)	167	80
West Sacramento	(Phelps Co., Rainbasin)	391	300
Willow Lake	(Cherry Co., N. Sandhills)	440	30
Anderson Bridge	(Cherry Co., N. Sandhills)	137	10
North River	(Lincoln Co., N. Platte Valley)	681	340
Platte	(Lincoln Co., Platte Valley)	242	120
Jack Sinn Memorial	(Lancaster Co., eastern Nebraska)	404	380
Pintail	(Hamilton Co., Rainbasin)	290	250
Gadwell	(Hamilton Co., Rainbasin)	90	80
Green Wing	(Clay Co., Rainbasin)	80	70
Wood Duck Addition	(Stanton Co., eastern Nebraska)	40	35
Blue Wing	(Clay Co., Rainbasin)	80	70
Kilpatrick Basin	(York Co., Rainbasin)	225	200
Chester Island	(Lincoln Co., Platte Valley)	70	70
Totals		13,627	8,454

*This list was compiled from a list of all Wildlife Lands owned by NGPC and is intended to include only those with significant wetland areas. An effort was made to exclude "open water" such as lakes and streams while including marshes, wet meadows and some riparian wetlands. Wetland acreage figures are general estimates only.

Source: Harold Edwards, NGPC, consultation in August, 1982, related to estimates contained in NGPC, 1972, p. 29

Platte River Habitat Maintenance Trust

Besides these major public programs which provide wetland protection in Nebraska, a private non-profit organization in the state also has acquired title or easements to several plots containing wetlands in the central Platte Valley. The organization is formally called the Platte River Whooping Crane Critical Habitat Maintenance Trust. The Platte River Trust as it is more commonly referred to has acquired one site on Mormon Island south of Grand Island containing 1,900 acres of grasslands (900 acres of which is subirrigated meadows with an additional 600 acres of type I wetlands). It owns another 200-acre wet meadow area which is planted to alfalfa and recently purchased an easement on another 800 acres of grassland on Shoemaker Island near Alda (600 acres of which is subirrigated meadow). The easement restricts commercial and industrial development of the area and its conversion to cropland. At this time, the Trust has no definitive plans for additional purchases (John Vanderwalker, Trust Fund executive secretary, personal communication, August 1982).

The Trust is financed with moneys received through a court settlement resulting from a suit by the State of Nebraska against a power consortium which diverts North Platte River waters for cooling purposes at a large coal-fired plant in eastern Wyoming [Nebraska v. Rural Electric Administration, 12 E.R.C. 1157 (D.Neb. 1978)].

Summary of Wetland Protection Through Purchase and Easement Programs

A summary of the estimated wetland acreage in the state and three major wetland regions protected under these existing public and private purchase or easement programs is contained in the table below. Nearly 12,000 acres of wetlands are protected in the Rainwater Basin. This is significant since only 14,000 to 24,000 acres are roughly estimated to remain as varying degrees of viable wildlife habitat. It would appear that much of the existing high quality basin areas (from the standpoint of habitat) in the Rainbasin are protected.

A relatively small amount of wetlands is protected in the central Platte Valley while nearly 19,000 acres are protected in the Sandhills largely on National Wildlife Refuges (a small percent of an estimated 1 million plus acres of Sandhills wetlands).

WETLAND ACREAGE PROTECTED BY EXISTING PROTECTION PROGRAMS*

Program Area	Total Acres	Wetland Acres	Rain-basin	Central Platte	Sand-hills
Water Bank Program (ASCS)	7,256	3,057	1,046	few	1,931
Waterfowl Prod. Areas (FWS)	14,657	8,200	8,200	few	-
National Wildlife Refuges	135,800	15,900	-	-	15,900
State Wildlife Areas (NGPC)[a]	13,600	8,450	2,370	600	1,165
Private-lands Habitat (NGPC)	45,000	350[b]	350	few	few
Platte River Trust (private)	2,900[c]	2,300	-	2,300	-
Totals	219,213	38,257	11,966	2,900	18,996

*wetland acreage figures attempt to exclude "open water" in the form of lakes and streams

[a] excludes areas without significant wetlands and some with associated riparian wetlands located outside of the three main study areas

[b] excludes any riparian wetlands that may exist on program lands (only basins)

[c] includes both acquisitions and easements

Note: Figures are meant to be largely general estimates synthesized from information provided by a variety of sources consulted in the study

SECTION 404 OF THE CLEAN WATER ACT AND THE FEDERAL 404 PERMIT PROGRAM

The State Department of Environmental Control recently completed a study of the feasibility of state-assumption of the 404 permit program with funding from EPA (DEC, 1982). Information generated in the course of this study is relied upon heavily in the following discussion.

As indicated in the earlier analysis of wetland legal protections in Nebraska, Section 404 of the federal Clean Water Act currently offers the only regulatory protection of privately-held wetlands in the state. Under the program, activities which involve some type of "discharge" or placement of "dredged or fill" materials into "waters of the United States" (including wetlands) must receive permitting to do so. The 404 permit program is administered by the U.S. Army Corps of Engineers through its district offices. The district office responsible for 404 administration in Nebraska is located in Omaha.

Several sets of regulations have been or are being used by the Corps in administering the program. The set used for most of the last five years was adopted July 19, 1977. Proposed rules containing some modifications were offerred September 19, 1980. These were recently largely adopted (July 22, 1982). Most of the discussion which follows relates to the 1977 regulations but an attempt is made to discuss areas where significant changes have been made in the newer revised regulations.

There are two major categories of regulated waters under the 404 program; navigable waters (and those readily subject to navigation) or the Missouri River and its adjacent wetlands in Nebraska, and all other waters of the U.S. which includes streams, lakes and wetlands not considered navigable in Nebraska. The first category of waters is ordinarily referred to as "Phase I waters" while the others are included in "Phase II" and "Phase III" waters under the Corps program.

Phase II and III waters include tributaries to navigable waters and interstate waters and their tributaries plus adjacent wetlands (also called "Categories 2 and 3" waters) and all other waters such as isolated lakes and wetlands, intermittent streams, prairie potholes, etc. (also called "Category 4" waters). Wetlands within the three wetland regions of this study are part of these Phase II and III waters.

While 404 jurisdiction can be clearly applied to navigable and other major waters of the U.S., interpretations vary considerably on

404 coverage of Category 4 waters. Wetlands are broadly defined as:

> Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions . . (1977 Corps Regulations & 1980 Proposed Regulations, underlining added)

The objectives or intent of Section 404 are stated and restated throughout the legislation itself and rules and regulations drafted to implement it. The overriding water quality objective is to ". . restore and maintain the chemical, physical, and biological integrity of the Nations waters" (Clean Water Act). Essentially, if activities involving placement of fill material of virtually any type into waters of the U.S. including wetlands cannot be undertaken in such a way as to not unduly conflict with this objective, they are prohibited. In application, however, Section 404 is meant to encourage if not force certain types of activities in certain areas to be done in such a way that they minimize any adverse impacts they may pose for the aquatic environment, rather than prohibit such activities.

The substantive criteria used in evaluating the acceptability of various types of 404 activities are the b(1) Guidelines developed by EPA in consultation with the Corps (Interim Guidelines were published in September, 1975, and Revised Guidelines took effect March 23, 1981). The Guidelines clearly recognize the value of wetlands. They are important in that they ". . serve important natural biological functions including food-chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic and land species . . serve as valuable storage areas for storm and flood waters . . and prime natural recharge areas" [230.4-1(a)(1)(i-iv)].

> Discharge of dredged material in wetlands may be permitted only when it can be demonstrated that the site selected is the least environmentally damaging alternative; provided, however, that .. the applicant is able to demonstrate that other alternatives are not practicable and that the wetlands disposal will not have an unacceptable adverse impact on the aquatic resources. [230.5(b)(8)(i), underlining added]

The burden of proof that it is necessary to discharge into wetland areas is assigned to the applicant.

> Discharges .. shall not be permitted unless the appli-

> cant clearly demonstrates . . (a) the activity .. must have direct access or proximity to, or be located in, the water resources in order to fulfill its basic purpose, or that other sites or construction alternatives are not practicable ("water dependency test"); and (b) that the proposed fill and activity associated with it will not cause a permanent unacceptable disruption to the beneficial water quality uses of the affected aquatic ecosystem .. [230.5(b)(8)(ii)]

In general, the Guidelines more simply state: "[I]f destruction of an area of waters .. may reasonably be avoided, it should be avoided" (Revised Guidelines discussion, p. 85340).

Both 1977 Regulations and 1980 Proposed Regulations state that "no permit will be granted to work in wetlands identified as important" . . unless it can be concluded that "the benefits of the proposed alteration outweigh the damage to the wetlands resource and the proposed alteration is necessary to realize those benefits" [320.4(b)(4)]. It is important to note that direct, indirect, cumulative and secondary effects and impacts must be considered in weighing the costs of a proposed activity under the b(1) Guidelines.

The extent and degree to which an environmental assessment is carried by the Corps depends upon the size, scope and location of the proposed activity and its perceived potential for ecological disruption. Again, both the potential impacts of a given activity taken individually as well as the potential cumulative impacts of many regulated activities over time on the resources of a given region are to be considered in this assessment.

Two types of 404 permits are used by the Corps: "individual permits" and "general permits." Individual permits are used when the activities proposed and water involved require case-by-case review. General permits are pre-authorized for categories of activities and waters that are substantially similar in nature and that are perceived to cause only minimal individual and cumulative adverse environmental impact.

General permits are issued on both a statewide and nationwide basis. Statewide general permits are issued at the district level and specify geographic limits of their coverage whereas nationwide permits are issued at the national level with nationwide applicability.

Nationwide permits were issued as part of the 1977 Corps Regulations and have been recently revised. Under the 1977 Regulations, certain prior discharges are covered under a "grandfather clause" (all regulated activities and waters were formally regulated after

July 1, 1977). Discharges into certain categories of waters also are covered including:

> (1) Non-tidal rivers, streams and their impoundments including adjacent wetlands located above the headwaters (defined as 5 cfs average annual flow)
>
> (2) Natural lakes, including their adjacent wetlands, that are less than 10 acres in surface area and that are fed or drained by a river or stream above the headwaters . .
>
> (3) Natural lakes, including their adjacent wetlands, that are less than 10 acres in surface area and that are isolated and not part of a surface river or stream . .
>
> (4) Other non-tidal waters .. other than isolated lakes .. that are not part of a surface tributary system to interstate waters or navigable waters of the United States
>
> [323.4-2(a)(1-4)]

Discharges into most "Category 4" waters including isolated wetlands are covered by this nationwide permitting provided they are not associated with a natural lake exceeding 10 acres in size (adjacent wetlands to lakes are included in determining their size) (1977 Regulations discussion, p. 37130). Under the 1977 Regulations, discharge activities involving natural lakes exceeding 10 acres would require individual permit processing. This 10-acre restriction on nationwide coverage is discarded under the newer revised regulations which went into effect this summer (July 22, 1982).

Activities covered are subject to conditions such as they will not destroy threatened or endangered species (or their critical habitat), are "toxic-free" discharges, will be properly maintained, and will occur outside of a component of the National Wild and Scenic River System.

A number of categories of activities are also covered under nationwide permitting including fills related to utility lines, bank stabilization, minor road crossings and bridges. These are significantly expanded under the new regulations.

Nationwide-permitted activities are subject to a number of "management practices" including:

> (1) Discharges .. should be avoided or minimized through the use of other practical alternatives

(2) Discharges in spawning areas during spawning seasons should be avoided

(3) [Discharges should not impede movement of indigenous aquatic species] .. or cause the relocation of waters (unless the primary purpose of the fill is to impound water)

(4) If the discharge creates an impoundment of water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, should be minimized

(5) Discharges in wetland areas should be avoided

(6) Heavy equipment working in wetlands should be placed on mats

(7) Discharges into breeding and nesting areas for migratory waterfowl should be avoided

(8) All temporary fill should be removed

[323.4(b)(1-8), underlining added]

The Corps may require individual permit processing on any discharge of dredged or fill material if the concern for the aquatic environment indicates such is needed. In providing this nationwide permit coverage to many types of wetlands, the Corps regulations note:

> We share the concern of the environmental groups that prairie potholes and many other isolated lakes are disappearing. The safeguards contained in the new management practices section .. as well as the authority vested in the District Engineers to process individual or general permits where the concerns of the aquatic environment so require, will, we believe, adequately protect the broad range of water quality concerns and the public interest in prairie potholes, small lakes and other waters . . (1977 Regulations discussion, p. 37131)

404 Coverage of Major Wetland Activities in Nebraska

As noted earlier, several types of activities in particular have impacted wetlands adversely in Nebraska. In the Rainwater Basin, drainage provided through road construction and maintenance activities in conjunction with agricultural-related drainage practices such as installation of drainage ditches, reuse pits or dugouts, and land leveling are principally responsible for the loss and deterioration or wetlands.

In the central Platte Valley, similar drainage practices have been used but much of the deterioration of wet meadow areas and shallow flats and marshes has resulted simply from land use changes requiring little or no drainage or land alteration (wet meadow grassland converted to cultivated meadow areas producing corn and/or alfalfa often with groundwater irrigation). Some groundwater decline in the area associated with groundwater development for irrigation in the central Platte Valley and Platte River streamflow reductions has made these wetlands more accessible and accomodating to these land use changes. Backwater areas and wetland areas lying in and nearby the river channel have largely been lost through encroachment of woody vegetation largely tied to stabilization and loss of Platte River flows.

In the Sandhills, wetland systems have been relatively stable up until recently. Expanding center pivot irrigation development in several areas of the Sandhills is now directly and indirectly impacting wetlands which are closely tied to the region's groundwater aquifer. Direct impacts result from land leveling and drainage practices sometimes used in installing center pivot systems where wetlands are present. Indirect impacts result from seasonal and potentially long-term declines in the groundwater table resulting from this irrigation development. Evidence suggests that Sandhills wetlands are highly sensitive to even modest declines in the groundwater table.

In determining whether 404 coverage extends to these activities, it should first be noted that "dredged material" is broadly defined as "excavated or dredged from waters of the United States" (both 1977 and revised regulations). Since wetlands are part of the definition of "waters of the United States," material excavated from them which is discharged or placed in them would ordinarily constitute a covered discharge activity.

Fill material is "any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a water body" (both sets of regulations). It is important to note that both terms exclude plowing, cultivating, seeding and harvesting for food production as discharge activities. Regulating these "normal farming activities" was not the intent of Congress in enacting Section 404 of the Clean Water Act and they are formally exempted from 404 coverage. "Construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance of drainage ditches" as well as "minor drainage" are also exempted under 1977 amendments to the Act. These exemptions are included in recently revised Corps regulations.

In exempting these agricultural activities, however, several conditions must be met. The activities must be part of an "established (i.e., on-going) farming, silviculture, or ranching operation" (1980 Proposed Regulations).

> Activities which bring an area into farming, .. or ranching use are not part of an established operation. An operation ceases to be established when the area on which it was conducted has been converted to another use or has lain idle so long that modifications to the hydrological regime are necessary to resume operations. [1980 Proposed Regulations, 323.4(a)(1)(ii)]

Activities considered "minor drainage" under the regulations are few and furthermore are limited by the following provision:

> Minor drainage in waters of the U.S. is limited to drainage within areas that are part of an established farming .. operation. It does not include drainage associated with the immediate or gradual conversion of a wetland to a non-wetland, or conversion from one wetland use to another. In addition, minor drainage does not include [any structure] which drains or otherwise significantly modifies a stream, lake, swamp, bog or any other wetland or aquatic area constituting waters of the United States. [1980 Proposed Regulations, 323.4 (a)(1)(iii)(a)(2)]

Where construction or maintenance of a farm pond or irrigation ditch, or maintenance of drainage ditches will "result in significant discernible alterations to flows or circulation" of U.S. waters, a 404 permit is required (1980 Proposed Regulations).

Maintenance of "transportation structures" is also exempted but this does not include "any modification that changes the character, scope or size of the original fill design." 1977 Corps Regulations contain no exemptions, per se. However, some of the same areas of concern are subsumed under provisions outlining nationwide permits.

Based upon these provisions and an overall reading of applicable legislation and rules governing the 404 program, several of the predominant activities affecting wetlands in Nebraska are potentially regulated by 404. In the Rainwater Basin, most activity accounting for wetland loss and deterioration are covered. Road construction projects and road ditch enlarging and deepening which directly or indirectly contribute to total or partial drainage of a wetland area are covered. Installation of ditches and reuse pits or dugouts by farmers in wetland areas to drain them (or at least have that effect) would appear to also be covered if any placement of dredged or fill material accompanies their installation. If these activities are conducted without discharging any excavated material into the wetland, conceivably they would not formally fall within 404 jurisdiction. However, such drainage activities seldom can be or are performed without directly, indirectly or incidentally discharging regulated dredged or fill material into the wetland area. In fact, excavated material is usually used as wetland fill.

A loophole in this coverage may exist if it can be argued that a wetland being drained is part of an "established farming operation." Many wetland areas in the Rainwater Basin are periodically cultivated and farmed before they are more permanently drained. Thus, this argument may often be made in attempting to escape 404 jurisdiction irregardless of whether or not this was the intent of Congress or the rulemakers.

Where land leveling in any of the wetland regions is employed in part to totally or partially fill wetland areas in the process of preparing a site for irrigation, it is not construed as an exempted "normal farming activity" and would be covered.

Where additional impoundments or diversions are proposed for the Platte River which involve discharge activities (which is always the case), 404 jurisdiction clearly applies and such proposals require 404 permitting. In evaluating the acceptability of these types of projects, important considerations would be their direct, indirect, secondary and cumulative impacts which all accompany large-scale projects such as these. Included in this would be the consideration of cumulative effects of existing projects combined with additional ones and such secondary effects as repercussions on downstream resources.

Activities which are contributing to the deterioration of wetland resources in the state which perhaps are outside of 404 regulatory authority include land use changes in the Platte Valley involving wetlands which have no associated discharge activity and irrigation development in general in both the Platte Valley and Sandhills with no discharge activities which undermines the viability of these areas' wetlands through seasonal and long-term groundwater drawdown.

Omaha District Corps Interpretations of 404 Coverage

These general interpretations of 404 coverage in Nebraska differ somewhat from those of the Omaha District Corps Office. Interpretations made in administering the 404 program on its coverage were generally solicited from the Omaha Corps Office [Omaha Corps Regulatory Branch (Ralph Miller, chief), telephone communication, August 1982].

According to information received in this communication, prior to the 1982 revised regulations, the Omaha Corps has required individual permit processing on most isolated wetland cases regardless of size. However, in some cases, the Corps exercised its discretion and used nationwide permitting on wetland applications.

Regarding the coverage of reuse pits or dugouts, the Omaha Corps indicated that these are considered "farm ponds and stock ponds" and are therefore exempt. This exemption, however, is contingent upon "landowners not using the excavated material as fill material in filling the wetland." If the material is mounded on both sides of a pit, it is exempted. Land leveling for irrigation which fills wetlands requires permitting according to the Corps.

When asked if road projects require permitting where deepening of roadside ditches improves the drainage of an adjacent wetland area, the Omaha Corps indicated "yes". Permitting is also required if road ditch work assists in draining outlying wetland areas not immediately adjacent to the roadside. The principal road construction activity the Corps has dealt with in Nebraska are cases where "roads go through or bisect a wetland."

When asked what the principal activity was that they had to deal with in administering 404 in Nebraska involving isolated wetlands, the response given was "land leveling for irrigation."

The Corps also indicated that cumulative effects are considered in evaluating 404 applications in certain noted wetland areas such as the Rainwater Basin and Sandhills. At the same time, wetland destruction may be permitted if it is "mitigated." Wetland destruction is considered mitigated if wetlands are "replaced" by other water areas created in the process of destroying them. As an example, the Corps indicated that a person installing a center pivot in a wetland area and filling the wetland through leveling was required to mitigate the wetland loss "by excavating an area in the corner of the field outside the pivot which would be pumped into periodically from a windmill-driven well."

In processing individual permits, a period of 70 to 80 days is ordinarily required on "noncontroversial" applications while 200 days and more are required on "controversial projects."

Finally, the Omaha Corps was asked what the effect of the 1982 revised regulations would be on wetlands in the state. The response given was that "isolated wetlands are now nationwided and their protection is gone . . while they're still nationwided, that doesn't preclude them from being filled."

404 Permit Activity in Nebraska

The 404 permit program is not the only permit program administered by the Corps of Engineers. It also administers permits under Sections 9 and 10 of the Rivers and Harbors Act of 1899. However, most permitting by the Corps in Nebraska involves 404 permits.

An historical context on Corps permit activity is provided in the table below. As can be seen, the regulatory role of the Corps of Engineers has greatly expanded in recent years as reflected in increased overall permit activity since around the mid-seventies, the time in which 404 permitting was initiated.

CORPS OF ENGINEERS PERMIT ACTIVITY IN NEBRASKA SINCE 1930 BY YEAR AND NUMBER OF "INDIVIDUAL PERMITS" ISSUED

1930	1	1940	3	1950	4	1960	15	1970	8		
1931	3	1941	2	1951	4	1961	10	1971	7		
1932	0	1942	4	1952	3	1962	2	1972	4		
1933	0	1943	5	1953	4	1963	10	1973	9		
1934	3	1944	1	1954	2	1964	3	1974	10		
1935	0	1945	3	1955	2	1965	1	1975	19		
1936	1	1946	1	1956	3	1966	3	1976	44		
1937	0	1947	3	1957	7	1967	12	1977	61		
1938	0	1948	3	1958	4	1968	9	1978	44	1980	73
1939	4	1949	4	1959	8	1969	4	1979	88	1981	84
Decade Totals	12		29		41		69		294		

Source: Omaha District Corps Office computer listing for Nebraska

The figures in the table above include only "individual permits" issued under Section 404 along with Section 9 and 10 permits. Since the mid-seventies, permitting has been for Sections 10 and 404 only. A breakdown of permitting since 1975 by type of permit and waters is shown in the next table.

"INDIVIDUAL PERMITS" ISSUED ACCORDING TO "NAVIGABLE WATERS" AND ALL OTHER WATERS IN NEBRASKA AND BY ISSUING AUTHORITY (Sect. 10, Sect. 10 & 404, Sect. 404), 1975 - 1981

	Navigable Waters				All Other Waters		
	(10)		(10 & 404)		(404)		Totals
1975	19		0		0		19
1976	40		2		2		44
1977	18	77	6	69	37	204	61
1978	10		10		24		44
1979	27		15		46		88
1980	14		21		38		73
1981	8		17		59		84
Totals	136		71		206		413

Of the 413 individual permits issued from 1975 to the end of 1981, 277 involved 404 permitting (67%). Section 404 permitting which involves the Missouri River ("navigable waters") also requires simultaneous Section 10 permitting although all Section 10 permitting does not require Section 404 clearance. None of the 71 Sections 10 and 404 permits on navigable waters are indicated as occurring in wetlands, per se, in the Corps computer files.

The category of permit activity that is of greatest relevance to the present study is that for other than navigable waters. All three major wetland areas included in the study would be included in this category of waters. Two hundred and six of the 277 Section 404 individual permits issued in the State since 1975 were issued for these waters. All but two of these were issued in the last five years (1977-1981) and these are analyzed further.

A breakdown of these 204 indivudal permits by type of permittee is shown in the following table. "Institutional entities" or permittees other than private individuals are by far the dominant type of 404 permittee (167 of 204 cases including both private and public entities, or 82 percent of the total).

"INDIVIDUAL 404 PERMITS" ISSUED IN ALL OTHER WATERS (other than "navigable waters") BY TYPE OF PERMITTEE, 1977 - 1981

	Individual[a]	Institutional Entity		Totals
		Private[b]	Public[c]	
1977	0	0	37	37
1978	2	1	21	24
1979	9	8	29	46
1980	9	3	26	38
1981	17	12	30	59
Totals	37	24	143	204

[a] 404 permits issued to "individuals" or applicants of comparable status

[b] 404 permits issued to private institutional entities such as: Devils Nest Development Corp., Northern Natural Gas Co., Cargill Inc., etc.

[c] 404 permits issued to public institutional entities such as: Lancaster County, Papio Natural Resources District, Nebraska Nebraska Department of Roads, etc.

A further evaluation of the 143 permits issued to public entities suggests that most were associated with either road projects or public water projects. Using permittees identified as a county or municipality, or as the State Roads Department, the estimated number of road projects is 31 in 1977, 14 in 1978, 23 in 1979, 15 in 1980 and 13 in 1981.

Using permittees such as natural resources districts, city parks and recreation departments, and state and federal agencies such as the Game and Parks Commission, Soil Conservation Service, Fish and Wildlife Service and Corps of Engineers itself as suggestive of water projects of some type, the number of individual 404 permits issued by year are: 3 in 1977, 3 in 1978, 4 in 1979, 7 in 1980 and 13 in 1981.

Thirty-seven "private individuals" received individual 404 permits, and 26 of these occurred in the last two years. Up until 1981, individual permit processing for 404-related activities on other than navigable waters in Nebraska seldom involved private individuals such as farmers or ranchers.

A further analysis of these 204 individual permits by type of activity is shown in the table below.

"INDIVIDUAL 404 PERMITS" ISSUED IN ALL OTHER WATERS (other than "navigable waters") BY TYPE OF ACTIVITY, 1977 - 1981

	1977	1978	1979	1980	1981	Totals
Fills	19	14	20	20	29	102
Fills & Riprap	9	5	15	11	13	53
Riprap	4	3	6	2	5	20
Submerged Pipeline & Fills	0	0	0	1	3	4
Dredging	1	1	0	0	1	3
Jetty & Fills	0	0	0	0	3	3
Jetty	0	0	1	1	0	2
Dike	1	0	0	0	2	3
Other[a]	3	1	4	3	3	14
Totals	37	24	46	38	59	204

[a] one of each: Fill-Piling-Riprap-Dike, Discharge Structure Outfall-Riprap, Dredging-Disposal Operation, Fill-Dredging-Riprap, Gabions, Fill-Breakwater-Marina, Fill-Coffer Dam, Jetty-Fill-Riprap, Overhead Cable-Fill, Boat Ramp-Fill-Riprap, Jetty-Dike, Boat Ramp-Fill, and Jetty-Riprap (2).

Source: Omaha District Corps Office computer listing

Many of the permitted activities are simply classified as "fills" (102 of 204 or half). About a fourth are classifed "fills and riprap" with the next largest category being "riprap." Of the 204 permits, 7 are for discharges above the headwaters (Omaha Corps code number: 0000) which ordinarily are permitted under existing nationwide authorizations. All of these are for fills and all except two were issued to the Nebraska Game and Parks Commission. The Omaha Corps indicated that these probably were subsequently included under a general permit (telephone communication, August 1982).

Of the 204 permits, only four are explicitly identified as occurring in "wetland areas" (Omaha Corps code number: 9999). Two occurred in 1979, one involving the State Department of Roads and the other Cuming County in northeast Nebraska. Both were identified as fills presumably involving road projects. Another occurred in 1980; a fill involving Sheridan County in northwest Nebraska in the Sandhills. The last occurred in 1981 involving a private individual in Madison County (a "fill" activity).

Other than the one permit involving Sheridan County, there have not been any individual 404 permits issued by the Omaha District Corps involving designated wetland activities in Nebraska's three major wetland regions (through 1981).

A variety of general permits are in effect in the state which establish abbreviated permitting of certain categories of activities on certain waters, subject to certain conditions including ultimate compliance with EPA's b(1) Guidelines. Fourteen individual general permits are in effect; seven governing activities on various segments of the Missouri River (portable intake structures, bank protection, etc.). The other seven involve other waters except one which applied to all waters of the state (No. 82-03 which permits permanent pumping facilities and associated fillings, primarily along streams).

A year-by-year tally of individual activities authorized under these general permits with those on waters other than the Missouri River in parentheses is as follows: 1977; 10 (1), 1978: 7 (2), 1979: 12 (9), 1980: 10 (7), 1981: 13 (6), and, year not indicated: 5 (2). Fifty-seven activities in all received general permit authorization with 26 of these occurring on non-navigable waters. None are indicated for wetlands (code number 9999).

Since few permits have been issued for activities in wetland areas of the state under either general or individual permits, the expectation would be that a relatively large number have been authorized under nationwide permitting. The table below shows individual authorizations under nationwide permitting in Nebraska since 1977.

"404 NATIONWIDE PERMITS" ISSUED IN NEBRASKA BY THE OMAHA DISTRICT CORPS OFFICE FOR OTHER THAN NAVIGABLE WATERS* BY TYPE OF PERMITTEE, 1977 - 1981

	1977	1978	1979	1980	1981	Totals
Individuals	6	7	4	11	14	42
Private Entities	2	4	4	11	6	27
Public Entities	28	24	22	47	47	168
Totals	36	35	30	69	67	237

* Only 1 nationwide permit was issued during this period for a discharge on navigable waters

Although not indicated in the table, 59 of these 237 nationwides are for activities above the headwaters (0000). Somewhat surprisingly, only 9 are designated wetland activities (9999). One of these occurred in both 1978 and 1979, five in 1980 and two in 1981. Of these 9, only four involved private individuals and each of these was for a "bulkhead and fills" activity. Because of the vagueness in how these activities are identified in the Corps computer files, it is not possible to further evaluate what occurred in these cases. However, the complete file on one of these nationwide authorizations was reviewed.

Records indicate that an unauthorized 404 activity on Smith Lagoon was reported to the Corps by FWS personnel in October, 1979. The activity involved the placement of fill material from a large reuse pit that had been constructed in the lagoon at the end of a field which extended into the wetland area. The upland portion of the field was under irrigated corn production and attempts had been made to farm the wetland portion of the field in a similar fashion. The reuse pit and filling were intended to improve the wetland's accessibility for this purpose.

Most of Smith Lagoon is owned and managed by the U.S. Fish and Wildlife Service (WPA area) and it is one of the more prominent wetland basins in the entire Rainwater Basin. In spite of this, the portion of the lagoon in which this activity had occurred was initially determined to not be a "wetland" by the Corps. After challenged on this determination and reevaluated, the area was designated a Type I wetland (Freel, Omaha Corps Environmental Resources Specialist memo, March 14, 1980). After determining that the area was a wetland and that the activity therefore required authorization, the Corps concluded:

> Through the 404(b) evaluation process . . it was concluded that the amount of fill placed in the wetland would not significantly alter the soil/moisture relationships and would not prevent the filled ground from reinvasion by predominantly annual wetland flora. Since the aquatic environment would not be adversely affected beyond the second growing season, it was determined that the completed work would be authorized under a Nationwide Permit. (Freel memo, March 14, 1980)

In its formal evaluation report on the activity, the Corps says:

> The land owner has placed fill material in a Type I wetland for the purpose of raising the ground elevation and to facilitate drainage from agricultural land into an adjacent irrigation reuse pit. The land has been farmed for row crops for the past 25-30 years and has served as a resting/feeding site for numerous waterfowl during the

> spring migration. Though the wetland area is annually or sporadically tilled and planted, the proximity of the water table to the soil surface enables several species of wetland plants to maintain viable populations. These plants, which are predominantly annuals, sprout from seeds each year and are largely unaffected by agricultural activities. The area consequently serves a dual and concurrent land use. Though no alternatives to the project were explored, it does not appear that prudent or feasible options were available to the landowner that would accomplish the activity's intended purpose. (Evaluation Report, File No. E 1 9999 0046)

Among other things, the Corps concluded that "the overall impact to the wetland's biological character" is "temporary," that the fill activity "would not affect species diversity," that the "aesthetic values of the wetland area would not be permanently affected," and that "this small loss of total wetland acres is expected to be only temporary and hunting would be little affected" (Evaluation Report, File No. E 1 9999 0046). Furthermore, "[s]ince reinvasion of the exposed soils by adjacent wetland plants will ensue, the filled area should revert to its original condition in a short period of time. Thus, the impact of the fill activity on local wildlife must be considered insignificant. It is recognized that the project site represents an integral component of the Smith Lagoon complex and excellent waterfowl habitat. [..] Annual tilling of the soil has thus maintained this area as a wetland whose function differs from that contained in Federal ownership" (Evaluation Report, File No. E 1 9999 0046).

Of the five other nationwides, four are public entities (three of which are counties presumably involving road projects, and one is an NRD). All of these are identified as "bulkhead and fills." The last nationwide was issued to a large insurance company for a fill which owns and manages farmland in Rock County.

A breakdown of all 404 activity in Nebraska since 1977 on other than navigable waters is shown in the table on the following page. In all, 467 activities received Corps 404 authorization over the five-year period. Of these, a total of only 13 permits involved wetland activity, slightly less than 3 percent of the total permit activity.

TOTAL 404 PERMITS ISSUED IN ALL OTHER WATERS IN NEBRASKA, 1977 - 1981

	1977	1978	1979	1980	1981	Totals	(Wetlands)
Individual	37	24	46	38	59	204	(4)
General	-	2	9	7(2*)	6	26	(0)
Nationwide	36	35	30	69	67	237	(9)
	73	61	85	116	132	467	(13)

*Year not indicated

Source: Omaha District Corps Office computer listing

Corps 404 Enforcement Activity in Nebraska

The District Corps Office in Omaha has five staff members involved in surveillance and monitoring plus field personnel located at eight area offices. In enforcing Section 404 provisions, the Corps relies heavily upon reports of suspected unauthorized activities from citizens-at-large, other agency persons, and their own personnel.

When a report is received, a field investigation is conducted. Usually, one Corps staffer conducts this investigation. However, in wetland cases, two are sent because of threats made to district personnel in past wetland cases.

The field investigation supplies information necessary to determine if a 404 violation actually exists. If so, a cease and desist order is issued if construction or associated activity is in progress. Then a determination is made if restoration is necessary. If not, an investigative findings is written by regulatory staff and sent to Corps counsel recommending legal action or requesting "after-the-fact" permitting be initiated.

Actual Corps enforcement activity in Nebraska by area of authority is shown in the table on the following page. Over 75 percent of all reported violations involve 404 authority. Of these, over 75 percent or 185 reportings were on other than navigable waters of the state. Of all reportings, 310 have been resolved in some way through February of 1982 or nearly 96 percent of the total. These are shown in the second table on the following page.

ENFORCEMENT ACTIVITY: UNAUTHORIZED ACTIVITIES REPORTED ACCORDING TO "NAVIGABLE WATERS" AND ALL OTHER WATERS, 1976 - 1981

Area of Authority	Navigable Waters					All Other Waters			Totals
	(10)	(10 & 404)	(404)	(13)	(a)	(10 & 404)	(404)	(a)	
1976	19	7	0	-	-	0	5	-	31
1977	7	4	0	-	-	1	7	-	19
1978	32	20	0	-	-	6	25	1	84
1979	4	18	0	-	1	1	53	3	80
1980	6	5	0	2	-	1	32	-	46
1981	2	6	0	1	-	1	53	-	63
Totals	70	60	0	3	1	10	175	4	323
		134					189		

[a] area of authority involved not specifically identified on computer printout

Source: Omaha District Corps Office computer listing for Nebraska

ENFORCEMENT ACTIVITY: UNAUTHORIZED ACTIVITIES "RESOLVED" AS OF THE END OF 1981 ACCORDING TO "NAVIGABLE WATERS" AND ALL OTHER WATERS, 1976 - 1981

Area of Authority	Navigable Waters					All Other Waters			Totals
	(10)	(10 &404)	(404)	(13)	(a)	(10 & 404)	(404)	(a)	
1976	19	7	0	-	-	0	5	-	31
1977	7	4	0	-	-	1	6	-	18
1978	31	15	0	-	-	6	21	1	74
1979	4	18	0	-	1	1	49	3	76
1980	4	3	0	1	-	1	26	-	35
1981	5	12	0	1	-	2	56	-	76
Totals	70	59	0	2	1	11	163	4	310

[a] area of authority involved not specifically identified on computer printout

Source: Omaha District Corps Office computer listing for Nebraska

In all, 178 unauthorized activities were resolved by the Corps for all other waters. The ways in which these were resolved are shown in the table on the following page. In none of the cases was any litigation involved. In fact, criminal penalties applicable to 404 enforcement have never been used in Nebraska and daily fines for 404 violations have never been levied. In the majority of cases, the Corps either determines that a permit is not required (70 of 178 cases) or an "after-the-fact" permit is extended (46 of 178 cases). In others, voluntary restoration is achieved or it is determined that the reported activity

ENFORCEMENT ACTIVITY: UNAUTHORIZED ACTIVITIES "RESOLVED" FOR ALL OTHER WATERS ACCORDING TO THE TYPE OF ENFORCEMENT ACTION TAKEN, 1976 - 1981

Potential Type of Enforcement Action	1976	1977	1978	1979	1980	1981	Totals
U.S. Atty. litigation, AF* is accepted, restoration	-	-	-	-	-	-	0
U.S. Atty. litigation, AF is accepted, no restoration	-	-	-	-	-	-	0
U.S. Atty. litigation, no AF, full restoration	-	-	-	-	-	-	0
no litigation, AF is accepted	-	2	9	20	4	11	46
no litigation, voluntary restoration	-	1	5	8	5	15	34
no permit is required	5	4	12	11	14	24	70
activity falls under permit previously issued	-	-	-	2	-	-	2
activity covered by nationwide permit	-	-	1	11	4	8	24
activity covered by general permit	-	-	-	1	-	-	1
activity covered under "grandfather clause"	-	-	1	-	-	-	1
Totals	5	7	28	53	27	58	178

* signifies an "After-the-Fact" permit

Source: Omaha District Corps Office computer listing for Nebraska

is covered under nationwide permitting. The majority of reported violations involve private individuals as indicated in the table below.

ENFORCEMENT ACTIVITY: UNAUTHORIZED ACTIVITIES "RESOLVED" FOR ALL OTHER WATERS ACCORDING TO TYPE OF VIOLATOR, 1976 - 1981

	1976	1977	1978	1979	1980	1981	Totals	
Individual[a]	4	3	14	29	17	41	108	(61%)
Private Institutional Entity	0	2	10	12	5	11	40	(22%)
Public Institutional Entity	1	2	4	12	5	6	30	(17%)
Totals	5	7	28	53	27	58	178	

[a] includes computer entries identified as "unknown"

Source: Omaha District Corps Office computer listing for Nebraska

Of all reported violations through 1981, 34 involve unauthorized activities in wetlands. Three were reported in 1978, 4 in 1979, 9 in 1980, and in 1981, 18 were reported, a relatively significant increase over prior years. Of these 18, 8 were reported by "citizens," 5 by FWS personnel, 3 by state agency personnel, and 2 by "others" (Corps computer file). None were reported by Corps staff themselves.

Fourteen of the reported wetland violations involved counties in the Rainwater Basin (Clay, Fillmore, Seward, Hamilton, and Kearney Counties). All were private individuals. Nine occurred in several eastern Sandhills counties (Garfield, Rock, Holt, Howard, and Logan).

Five involved private individuals, one a county roads department, and three, private institutional entities (one an insurance company owning farmland in the area and the other a sand and gravel company).

Thirty of the 34 reported wetland violations have been resolved (as of February, 1982). In 17 cases, the Corps decided a permit was unnecessary and in three others, an after-the-fact permit was given. Coverage by nationwide permitting was determined for five others and voluntary restoration was achieved in four cases. Voluntary restoration in most cases amounts to the party removing an illegal fill. There was no litigation. When asked to elaborate on the nature of these decisions, Corps personnel said this could only be done case-by-case and this would require extensive review of the files.

Summary: 404 Implementation in Nebraska in Protecting Wetlands

While Section 404 of the Clean Water Act and the permit program implementing it as described in Corps and EPA rules and regulations would appear to offer some protection for wetlands in Nebraska (particularly those held in private hands), data on Corps permit activity suggests that this has largely not occurred. While literally hundreds if not thousands of individual activities have occurred in Nebraska in the last five years leading to the further draining and loss of wetlands (e.g., installation of reuse pits and dugouts in the Rainbasin, ditch-deepening and widening in wetland areas by county roads departments, land leveling and filling of wetlands in the Sandhills for irrigation, etc.), a review of Corps permit activity over this period suggests that these activities are proceeding largely unregulated.

Few potentially-regulated activities accounting for much of the wetland loss in any of the three major wetland regions of the state have received 404 permitting. In fact, only 13 permits in all were issued statewide on designated wetlands.

While indicating that land leveling and filling of wetlands is the major activity involved with isolated wetlands in the state, there is no evidence in the Corps computer files that a permit has ever been issued involving this situation. While wetland violations have often been reported to the Corps by private individuals and outside agency personnel, litigation was never used (through 1981).

Thus, after reviewing pertinent legislation and regulations governing the 404 program and actual permit activity involving wetlands in the state, it can only be concluded that the program remains largely unimplemented in Nebraska.

Legal Analysis of 404 Implementation Responsibility (J. David Aiken)

The Clean Water Act authorizes citizen suits to enforce promulgated effluent standards or limitations [33 U.S.C.§ 1365(a)]. This provision apparently would not authorize citizen suits protesting either alleged 404 permit requirement violations or alleged failures of Corps officials to properly administer 404 program requirements.

A related issue is what private remedies may be available if a federal official fails to properly administer the 404 program and third parties (e.g., private environmental groups or wildlife proponents) are harmed because of unauthorized wetland destruction. Generally, a party who can demonstrate that he has been harmed or will be harmed by an administrator's failure to act can go to court to force an administrative officer to take official action. This is normally referred to as a writ of mandamus [Davis, Administrative Law Treatise § 23.04 (3d ed. 1972)]. More specifically, a private party can through a mandamus action: (1) control nondiscretionary acts, (2) require the exercise of administrative discretion, and (3) prevent an abuse of administrative discretion. Mandamus cannot be used, however, to control the manner in which administrative discretion is exercised so long as that discretion is not abused. Mandamus usually will be denied by the court if statutory provisions for administrative review were not followed.

As a general rule, a governmental entity is not liable for the private injuries it may cause based on the legal principle of sovereign immunity [Davis, supra, § 26.01]. If the private injury is caused by a failure to act (referred to in legal terms as nonfeasance) courts occasionally have awarded damages to injured private parties (Davis, § 25.04). Generally, however, administrative officials are not liable for injuries resulting from the exercise of their administrative discretion (Davis, § 26.02). Recovery of damages from administrative officials by private parties is difficult.

Publicly owned resources may be subject to the public trust doctrine, which means that the State cannot authorize the resource to be converted to private use in a way detrimental to the public. The public trust doctrine has neither been recognized nor rejected by the Nebraska Supreme

Court. The doctrine might be applied to surface water and ground water, since both are publicly owned in Nebraska. Wetlands are not considered to be surface water as far as water allocation law is concerned, as discussed previously. Wetlands are included in the waters of the state as far as water quality statutes are concerned, however. Whether this is sufficient to bring wetlands within the public trust doctrine has not been addressed in Nebraska.

Other Agency Involvement in 404 Permitting

Besides the Corps, two other federal agencies have major roles under the 404 program. EPA, primarily through its Kansas City Regional Office, is charged with not only developing and overseeing the use of the b(1) Guidelines but with supervising and assisting in overall 404 enforcement.

The Department of Interior through its Fish and Wildlife Service is charged with reviewing 404 applications and providing to the Corps input on their ecological significance. A FWS field office in Grand Island reviews 404 applications in Nebraska. From 1976 to 1981, the Grand Island office received 245 permit applications for 404 activities in Nebraska on other than navigable waters and made the following recommendations:

no response	4	(1.6% of the total)
no action	36	(14.7%)
no objection	133	(54.3%)
modifications needed . . .	57	(23.3%)
denial recommended	10	(4.1%)
full restoration needed . .	2	(0.8%)
partial restoration " . . .	3	(1.2%)

Source: FWS correspondense, February 5, 1982 (DEC, 1982)

In assessing Corps administration of the program, FWS staff in Grand Island indicated:

> A considerable amount of habitat and number of wetlands have been lost in the Rainwater Basin and somewhat in the Sandhills through illegal filling. The Corps' main effort is in processing permits with very limited enforcement effort. Also, there has been limited effort toward restoration on illegal activities pursued by the Corps. Additionally, the delineation of wetlands and application of 404,

> in our opinion, has been conservative by the Corps.
> (FWS correspondence, DEC 404 study, February 1982)

FWS staff say the program, however, can effectively preserve Sandhill and Rainwater Basin wetlands if properly enforced with stricter application of environmental assessment criteria and better public information on the program, it goals and objectives. FWS also said the 404 program must be tied to other regulatory functions such as groundwater management programs to truly be effective in protecting wetlands.

Two agencies of state government also have major roles under the program. The role of the Nebraska Game and Parks Commission is similar to that of FWS. It advises both the Corps and the State Department of Environmental Control which conducts 401 certification reviews on 404 applications. Essentially, the 401 reviews are done to determine if proposed activities may violate state water quality standards.

It is not unusual for DEC to receive after-the-fact requests for certification in which activities being evaluated have already undergone some construction or are complete prior to filing an application with the Corps.

DEC recently completed an EPA-supported study to examine the feasibility of the state assuming administration of 404 permitting on non-navigable waters of the state (including wetlands of the three regions). The feasibility study found that the state has necessary expertise and legal authorities to assume the responsibility, that greater coverage of the program could be extended while still saving around $40,000 annually in program costs in comparison to present Corps costs, and that DEC has statutory authority to develop a comprehensive wetland protection program (DEC, 1982).

The state recently received a training grant from EPA to test state assumption of the program. If assumed, Nebraska will be the first state in the nation to exercise this state prerogative.

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